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**The Madagascan endemic myrmicine ants related to *Eutetramorium*  
(Hymenoptera: Formicidae): taxonomy of the genera *Eutetramorium* Emery,  
*Malagidris* nom. n., *Myrmisaraka* gen. n., *Royidris* gen. n., and *Vitsika* gen. n.**

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## Abstract

The monophyletic group of myrmicine ant genera related to *Eutetramorium* is described and its taxonomy is documented. The group is endemic in Madagascar and contains five genera: *Eutetramorium* Emery, 1899 (3 species, 1 of which is new); *Malagidris* nom. n., a replacement name for *Brunella* Forel, 1917, junior homonym of *Brunella* Smith, G.W. 1909 (Crustacea) (6 species, 5 of which are new); *Myrmisaraka* gen. n. (2 species, both new); *Royidris* gen. n. (15 species, 11 of which are new); *Vitsika* gen. n. (14 species, all of which are new). Keys to the worker caste are provided for all genera, and provisional keys to known males are given for *Malagidris* and *Vitsika*.

**Key words:** Madagascar, ants, taxonomy, *Eutetramorium*, *Malagidris*, *Myrmisaraka*, *Royidris*, *Vitsika*

## Introduction

In this day and age it is very uncommon to have the opportunity to study an entirely new group of ant genera in which most species are undescribed. Madagascar is one of the few places left on earth where such a myrmecological feat is still possible. This study introduces a new myrmicine group of ant genera, containing five genera and a total of 40 species (33 of which are new), found only on the island of Madagascar. Morphologically, the group spans a wide range of characters, reflecting its extensive radiation on the island, with various genera paralleling other myrmicines from elsewhere in the world. Few species within the group had been discovered and described until the present time (Table 1), when the extensive collecting activities of one of us (BLF) radically changed the situation by providing hundreds of specimens from a very wide range of habitats.

**TABLE 1.** Year and number of species described for each genus.

Genus	1895	1899	2006	This Report	Total
<i>Eutetramorium</i>		2		1	3
<i>Malagidris</i>	1			5	6
<i>Myrmisaraka</i>				2	2
<i>Royidris</i>	1		3	11	15
<i>Vitsika</i>				14	14
<b>total</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>33</b>	<b>40</b>

Each of the genera is morphologically quite distinct, but the same cannot be said of this monophyletic group. Its existence has only been revealed by the detailed DNA studies of Prof. Philip S. Ward at the University of California and his collaborators, which currently remain unpublished. Nevertheless, we are very grateful to him for permission to use this valuable information. We have attempted to provide an inclusive diagnosis of the group, based on the worker caste, but it is apparent that the comparative morphology of Myrmicinae, between subfamily and genus ranks, remains as inadequate as when it was last reviewed (Bolton, 2003).

As is usual in taxonomic surveys such as this, morphological analysis of the worker caste forms the basis, and the major part, of the revision. This is because the worker is by far the most common and numerous caste, and therefore the one most commonly encountered and collected. *Eutetramorium* group queens (gynes) that have been collected are often ergatoid (Heinze *et al.*, 1999). Queens of 25 species have been recorded: in 12 species only alate gynes are known, in 9 only ergatoids are known, and 4 species produce both kinds of queen. In 2 species there are also morphological intermediates between normal alates and ergatoids. Species where only one form of gyne has been recorded may be able to produce other forms; this question will be resolved only with further sampling and observation. Males are, of course, the least well represented sex, because of their seasonal production and transience in colonies. They are known or tentatively associated with workers in only 12 species throughout the group. There are a few other males, collected in isolation in Malaise traps, that can be identified to genus but cannot be associated with any female caste.

### Abbreviations of depositories

- ANIC Australian National Insect Collection, Canberra City, Australia.  
 BMNH The Natural History Museum, London (= British Museum, Natural History), U.K.  
 CASC California Academy of Sciences, San Francisco, California, U.S.A.  
 MCZC Museum of Comparative Zoology, Cambridge, Mass. U.S.A.  
 MHNG Muséum d'Histoire Naturelle, Genève, Switzerland.  
 MSNG Museo Civico di Storia Naturale "Giacomo Doria", Genova, Italy.

### Standard measurements and indices

Measurements were taken using an optical micrometer, to the nearest 0.01 mm, on a Wild M5 microscope. All measurements are expressed in millimetres.

Total Length (TL). The outstretched length of the head and body, from the apex of the mandible to the apex of the gaster.

Head Length (HL). The length of the head capsule excluding the mandibles; measured in full-face view in a straight line from the mid-point of the anterior clypeal margin to the mid-point of the posterior margin (not including the median clypeal tooth in *Eutetramorium*).

Head Width (HW). The maximum width of the head behind the eyes, measured in full-face view.

Cephalic Index (CI). HW divided by HL,  $\times 100$ .

Eye Length (EL). In profile, the maximum measurable length of the compound eye.

Scape Length (SL). The maximum straight-line length of the scape, excluding the basal constriction or neck that occurs just distal of the condylar bulb.

Scape Index (SI). SL divided by HW,  $\times 100$ .

Pronotal Width (PW). The maximum width of the pronotum in dorsal view; in the *Eutetramorium* group this usually occurs posterior to the humeral angles.

Weber's Length of Mesosoma (WL). The diagonal length of the mesosoma in profile, from the angle at which the pronotum meets the cervical shield to the posterior basal angle of the metapleuron.

Metafemur Length (MfL). The maximum straight-line length of the metafemur, from its apex to its junction with the metatrochanter.

Metafemur Height (MfH). In full anterior or posterior view, the maximum measurable height of the metafemur from dorsal to ventral margin.

## Images

Digital colour images were created using a Leica DFC425 digital camera and Leica Application Suite software (ver. 3.8).

## Maps

Distribution maps were created using the R platform (R Development Core Team 2014) based on geographic coordinates of the specimens cited in this article. However, extensive myrmecological exploration of Madagascar is ongoing and readers are strongly encouraged to consult more detailed and regularly updated distributional data available on AntWeb.org, where existing and future distributions can be mapped interactively and at higher resolution. Species distributions are mapped over the outlines of four simplified ecoregion zones of Madagascar (Schatz, 2000; following Cornet, 1974). The four ecoregions are eastern rainforest (light gray), central montane forest (dark gray), west dryforest (white), and southwest desert spiny bush thicket (medium gray).

## The *Eutetramorium* genus group

### Diagnosis of worker

Members of the subfamily Myrmicinae with the following characters in combination.

- 1 Mandible triangular, with 5–11 teeth; trulleum closed; masticatory margin longer than basal margin.
- 2 Palp formula predominantly 5,3, uncommonly 4,3, or 4,2, the palpomeres unspecialised.
- 3 Stipes with transverse crest varying from strongly present to absent.
- 4 Clypeus usually with a narrow anterior apron; without a differentiated median carina; median portion of clypeus usually longitudinally costulate or rugulose, not bicarinate but its lateral margins may be enhanced; anterior margin with or without an unpaired median seta.
- 5 Clypeus with median portion moderately broadly inserted between frontal lobes; in full-face view width of clypeus between the frontal lobes, at their point of maximum divergence, is at least 1.25 times greater than the maximum width of one of the lobes, and is 0.40–0.48 times the width across both lobes at their point of maximum divergence.
- 6 Torulus with upper lobe visible or concealed; when visible the torulus lobe projects beyond the lateral margin of the frontal lobe at or just behind the widest point of the lobe.
- 7 Frontal carinae absent or present behind the frontal lobes; antennal scrobes absent, or present above the eye.
- 8 Antenna 12-segmented, with an apical club of 3–5 segments.
- 9 Eyes present, in front of to slightly behind the midlength of the head capsule in full-face view.
- 10 Promesonotal suture absent from dorsum of mesosoma.
- 11 Propodeum unarmed, bidentate or bispinose, the dorsum frequently long; propodeal lobes rounded.
- 12 Propodeal spiracle does not abut the margin of the declivity.
- 13 Mesothoracic anteroventral transverse trench present on each side of a median crest.
- 14 Metasternal process present only in large *Eutetramorium*; otherwise absent, but usually a pair of carinae present that diverge posteriorly from each side of the metasternal pit and frequently reach the inner margins of the metacoxal foramina; these carinae are usually highest on each side of the metasternal pit and sometimes visible as a low peak in profile.
- 15 Propodeal foramen with its anterior margin extending anterior to the posterior margins of the metacoxal foramina.
- 16 Procoxae larger than mesocoxae or metacoxae.
- 17 Tibial spurs: mesotibia 0 or 1, metatibia 1; simple when present, sometimes very slender and almost indistinguishable from the setae at the tibial apices.

- 18 Petiole nodiform and with an anterior peduncle, the spiracle usually close to the midlength of the peduncle, never at the node, never abutting the anterior articulation.
- 19 Subpetiolar process present anteroventrally on peduncle, appearing in profile as an angle or a small tooth, in ventral view usually as a transverse ridge or crest.
- 20 Peduncle of petiole anteroventrally with a roughly U-shaped articulatory area that narrows posteriorly to the subpetiolar process, which forms a posterior margin. The articulatory area is marginate on each side, and is bounded anteriorly by a transverse strip of cuticle to which the intersegmental membrane of the propodeal foramen is attached.
- 21 Stridulitrum present on pretergite of first gastral segment (abdominal segment 4).
- 22 Tergite of abdominal segment 4 does not overlap the sternite on the ventral surface of the gaster.
- 23 Gastral shoulders weakly present to absent.
- 24 Sting well developed and functional, simple, without an apical lamellate appendage, never spatulate, never thread-like.
- 25 Main pilosity of head and body simple, frequently, but not universally, absent from propodeal dorsum.

### Comments on *Eutetramorium* group worker characters

It is not yet possible to indicate any unequivocal morphological apomorphies of this endemic Madagascan group. The subfamily Myrmicinae is huge, with frequent convergence and parallelism among characters so that analogues of each appear to have been developed independently several to many times. As a result, the best that can be attempted here is an inclusive diagnosis. However, the group is retrieved as an unambiguous monophyletic clade by molecular techniques (Prof. Philip S. Ward, pers. com., currently unpublished). The numbers below refer to the character numbers listed above.

2 Palp formula 5,3 is universal in the group except in *Eutetramorium* itself. There, two species have PF 4,3, and one has PF 4,2. A palp formula of 5,3 is common in Myrmicinae, occurring in 33 of 136 genera (Bolton, 2003). Palp formula 4,3 is slightly less commonly encountered in the subfamily (28 genera out of 136), but PF 4,2 is rare, being predominant only in the Neotropical Attini and in a few species scattered through six other genera.

3 The stipital crest is present in all genera of the group except *Royidris*. In *Eutetramorium* and *Vitsika* it is coarse, and the area of the stipes distal of the crest is depressed and concave. In *Royidris* the crest is very reduced, functionally absent, at best visible as a weak line across the stipes. In the other genera the crest is fine and curves across the stipes, usually just distal of its midlength, and is often more strongly developed at the median border of the stipes (adjacent to the labium), tending to decrease in definition as the lateral stipital border is approached.

4 The clypeal apron is very reduced only in *Malagidris sofina*. An unpaired seta at the midpoint of the anterior clypeal margin is characteristic of *Malagadris*, *Royidris* and *Vitsika*; a pair of short, fine setae that straddle the midpoint occurs in *Myrmisaraka*, where the margin is also notched at the midpoint, and in *Eutetramorium*, where the paired setae are on each side of a median tooth or prominence.

6 In most *Vitsika* species, and in *Eutetramorium*, the torulus lobe is concealed by the broad frontal lobe on each side.

7 Elongate frontal carinae and antennal scrobes are developed only in *Vitsika*, elsewhere the frontal carinae are represented only by the frontal lobes.

8 The antennal club is usually 3-segmented. It is 4-segmented in the *Royidris notorthotenes* group, and weakly 5-segmented only in *Myrmisaraka producta*.

13 On the ventral mesosoma there is a transverse depression or trench, U-shaped in section, on each side of a median longitudinal ridge of cuticle, located at the anterior end of the mesothorax just posterior to the procoxal cavities. The trench is commonly developed in myrmicines, but in numerous genera and groups of genera it is narrow, reduced or poorly defined (e.g. *Atopomyrmex*, *Gauromyrmex*, *Myrmicaria*, *Ocymyrmex*, the *Leptothorax* and *Temnothorax* genus groups), and in some it is extremely reduced or absent (e.g. *Tetramorium*, *Cephalotes*, *Cataulacus*). The various developmental states of this structure, and their phylogenetic significance, await a proper investigation.

14 In *Eutetramorium mocquerysi* a large metasternal process is present, and there is also a bidentate mesosternal process.

17 In almost all species of the group a single mesotibial and metatibial spur is present, and obviously distinguishable from the setae at the tibial apices. However, in smaller species of *Vitsika* and *Royidris* reduction of the spurs is extreme, and they become indistinguishable from the apical setae under light microscopy.

20 The comparative morphology of the propodeal-petiolar articulation has never been investigated, but shows considerable variation through the Myrmicinae. The structure as described above for the *Eutetramorium* group appears most closely paralleled in *Temnothorax* and *Huberia*.



22 and 23 In numerous myrmicines, for example the solenopsidines and pheidolines (among others, see Bolton, 2003, for distribution) the fourth abdominal (first gastral) tergite strongly overlaps the sternite ventrally, so much so that in ventral view the tergite is extensively represented on the ventral surface. The tergite overlaps the sternite from each side and the inner margins of the tergite form a pair of convex longitudinal arcs in ventral view. Because of this the visible sternite appears narrowest at about its midlength and broadens posteriorly as the tergal arcs diverge. Anteroventrally, as the convex arcs of the tergal margins diverge, before suddenly curving in to the articulation of postpetiole and first gastral segment, the sternite tends to project forward beyond the margins of the tergite, to form a pair of shoulders that project anteriorly, one on each side of the articulation. These anterior projections of the sternite are frequently visible in dorsal view and constitute the gastral shoulders. The alternative, without the developments just described, occurs in the *Eutetramorium* group, and in many other groups. In ventral view the fourth abdominal (first gastral) tergite margins the sternite laterally, but does not extensively overlap onto the ventral surface. The inner margins of the tergite tend to be convex to more or less straight, and usually diverge posteriorly. Thus the visible sternite does not appear narrowest at about its midlength, but instead usually broadens posteriorly. Anteroventrally, the tergal margins converge evenly to the articulation of the postpetiole with the first gastral segment, and the sternite on each side does not project forward beyond the margins of the tergite. As a result there are no shoulders that project anteriorly on each side.

The myrmicine genus that morphologically corresponds most closely to the *Eutetramorium* group definition above appears to be *Huberia* Forel, a strange little genus of only two species that is confined to New Zealand (Brown, 1958; Don, 2007). Its type-species, *H. striata* (F. Smith), largely matches the definition of the *Eutetramorium* group, but differs significantly as the upper lobe of the torulus projects anterior to the widest point of the frontal lobe, there is no clypeal apron, a large metasternal process is present (as is a mesosternal process), the antenna has 11 segments, the vestigial track of the promesonotal suture is retained across the dorsum of the mesosoma, and the propodeum is relatively short.

## Synopsis of genera of the *Eutetramorium* group

*Eutetramorium* Emery, 1899: 280. Type-species: *Eutetramorium mocquerysi* Emery, 1899: 281, by subsequent designation of Wheeler, W.M. 1911: 163.

*Malagidris* Bolton & Fisher **nom. n.**

*Brunella* Forel, 1917: 234. Type-species: *Aphaenogaster belti* Forel, 1895: 248, by monotypy. (Junior synonym of *Aphaenogaster* Mayr, 1853: 107; Bolton, 1982: 341; revived from synonymy here.) [Junior homonym of *Brunella* Smith, G.W. 1909: 87 (Crustacea).]

*Myrmisaraka* Bolton & Fisher **gen. n.** Type-species: *Myrmisaraka producta* Bolton & Fisher **sp. n.**, by present designation.

*Royidris* Bolton & Fisher **gen. n.** Type-species: *Monomorium robertsoni* Heterick, 2006: 93, by present designation.

*Vitsika* Bolton & Fisher **gen. n.** Type-species: *Vitsika crebra* Bolton & Fisher **sp. n.**, by present designation.

## Key to genera of the *Eutetramorium* group (workers and queens)

- 1 Anterior clypeal margin with a triangular tooth or prominence at its midpoint. Palp formula 4,3 or 4,2. Antennal socket and torulus within, and surrounded by, a depressed antennal fossa; anterior margin of the fossa is formed by the posterior surface of the lateral portion of the clypeus, which is raised into a ridge or shield-wall in front of the antennal socket . . . ***Eutetramorium***
- Anterior clypeal margin rounded or notched at its midpoint, without a triangular tooth or prominence. Palp formula 5,3. Antennal socket and torulus not within a depressed antennal fossa; posterior surface of the lateral portion of the clypeus not raised into a ridge or shield-wall in front of the antennal socket. . . . . 2
- 2 Frontal carinae extend to close to the posterior margin of the head and form the upper margins of antennal scrobes . . . ***Vitsika***
- Frontal carinae restricted to frontal lobes; antennal scrobes absent . . . . . 3
- 3 Propodeum unarmed. Mandible with 5 teeth . . . . . ***Royidris***
- Propodeum bispinose. Mandible with 8–13 teeth . . . . . 4
- 4 Anterior clypeal margin with a small median notch, usually with a pair of short, slender setae, one on each side of the midpoint within the notch. Eye relatively larger, EL/HW 0.30–0.35; in full-face view eyes located at about the midlength of the side of the head capsule. Propodeal dorsum with > 2 pairs of setae; dorsal (outer) surface of metatibia with standing setae present. Antennal club of 3 to 5 segments . . . . . ***Myrmisaraka***
- Anterior clypeal margin without a median notch, with a single, unpaired, stout seta at the midpoint of the margin. Eye relatively smaller, EL/HW 0.24–0.30; in full-face view eyes obviously located in front of the midlength of the head capsule. Propodeal dorsum with 0–2 pairs of setae; dorsal (outer) surface of metatibia without standing setae present. Antennal club of 3 segments . . . . . ***Malagidris***

## Genera of the *Eutetramorium* group

### Genus *Eutetramorium*

(Figs 1–9, Maps 123–125)

#### *Eutetramorium* Emery

*Eutetramorium* Emery, 1899: 280. Type-species: *Eutetramorium mocquerysi* Emery, 1899: 281, by subsequent designation of Wheeler, W.M. 1911: 163.

#### Diagnosis of worker

Monomorphic myrmicine ants.

Mandible triangular; masticatory margin with 6–8 teeth, longer than the basal margin.

Palp formula 4,3, or 4,2.

Stipes of maxilla with a coarse transverse crest.

Clypeus posteriorly moderately broadly inserted between the frontal lobes; median portion of clypeus broad, not bicarinate.

Clypeus with lateral portions raised into a shielding wall or sharp ridge in front of the antennal sockets.

Clypeus with a tooth or triangular point at midpoint of anterior margin; without an unpaired seta at the midpoint.

Frontal carinae restricted to frontal lobes, never extending to the posterior margin of the head.

Antennal scrobes absent.

Antenna with 12 segments, with an apical club of 3 segments; scape distinctly downcurved near its base.

Antennal socket and torulus subtended by a depressed antennal fossa; anterior margin of the fossa is formed by the posterior surface of the narrow, raised, lateral portion of the clypeus.

Torulus with upper lobe concealed by the frontal lobe in full-face view. In profile the torulus lobe large, directed downward over the condyle of the scape.

Eyes present, located slightly in front of, to slightly behind, the midlength of the side of the head capsule in full-face view.

Head capsule without a median, longitudinal carina.

Pronotal humeri rounded in dorsal view.

Metanotal groove impressed.

Propodeum bispinose or bidentate.

Propodeal spiracle behind midlength of sclerite.

Metasternal process present.

Tibial spurs: mesotibia 0 or 1; metatibia 0 or 1; simple when present.

Abdominal segment 4 (first gastral) tergite does not broadly overlap the sternite on the ventral gaster; gastral shoulders absent.

Sting simple, without a spatulate to pennant-shaped lamellate appendage that projects from the dorsum of the shaft near or at its apex.

Main pilosity of dorsal head and body: simple.

#### Diagnosis of queen (gyne)

Extreme ergatoid in *mocquerysi*, alate in *monticellii*. In *parvum* a normal dealate queen is present in the type-series, but there is also a specimen that may be an ergatoid or a worker-queen intercaste, or possibly merely an oversized worker, as discussed under *parvum*. Dealate queen with characters as worker except for the usual modifications of the mesosoma and the presence of ocelli. Venation: see under male.

#### Diagnosis of male

Known only for *E. mocquerysi*. Smaller than conspecific worker. Mandible stoutly triangular, with 7 teeth. Palp formula 4,3. Stipital crest present on maxilla. Antenna with 13 segments, filiform. SI 31. First funicular segment short but not globular, about one quarter the length of the second funicular segment. In full-face view eye located in front of midlength of head capsule. Ocelli small, conspicuous. Occipital carina sharp but not forming a raised crest. Mesotibia and metatibia each with a single spur, barbate on mesotibia, weakly pectinate on metatibia. Notauli weakly present, the anterior arms forming a V-shape. Mesoscutum anteriorly, between the notauli arms, with a

longitudinal median carina that is narrowly bifurcated anteriorly. Mesopleuron with a marked transverse sulcus. Propodeum unarmed, the spiracle low on the side and in front of the midlength of the sclerite; propodeal lobes conspicuous, rounded. Petiole with a short, stout anterior peduncle and a short but relatively high node, the spiracle about level with the base of the anterior face of the node. Postpetiole greatly elongated, in profile almost twice the length of the petiole. Subpetiolar process present, small. Cerci present.

Forewing venation (based on male of *mocquerysi* and queen of *monticellii*).  $Rs \cdot f4-5$  does not meet  $R \cdot f3$  on anterior margin of wing (= marginal cell open).  $2rs-m$  absent.  $1m-cu$  present. Fusion of  $Rs+M$  extended distally, so that  $1m-cu$  arises from  $Rs+M$ , not from  $M$ .  $Rs \cdot f3$  present ( $Rs+M$  divides into  $Rs \cdot f3$  and  $M \cdot f3-4$  proximal of the junction with  $2r-rs$ ).  $A \cdot f2$  long, not merely a stub distal of  $cu-a$ . In *monticellii* queens  $cu-a$  is retracted toward the wing base and arises from  $M+Cu$ , proximal of the point where it divides into  $M \cdot f1$  and  $Cu \cdot f1-2$ . However, in the single *mocquerysi* male examined,  $cu-a$  arises at the point where  $M+Cu$  divides.

### Comments on *Eutetramorium*

This small genus was established by Emery (1899) for two conspicuous, large, darkly coloured Madagascan species that superficially resemble *Tetramorium*. Initially, Emery (1912, 1914) was of the opinion that the genus was referable to the tribe Myrmecini, but Ashmead (1905) and Wheeler (1910) had already referred it to Tetramoriini, an opinion that Emery (1915b, 1924) also came to accept. Bolton (1976) excluded *Eutetramorium* from Tetramoriini on morphological grounds, and tentatively transferred it to Myrmicini. This placement persisted until recently, when a molecular analysis of Myrmicini by Jansen & Savolainen (2010) showed that the monophyly of the tribe was dubious, and that *Eutetramorium* formed a clade with *Huberia*. The yet unpublished, more detailed, DNA analysis of Myrmicinae by Philip S. Ward has established that *Eutetramorium* belongs in a strongly supported, endemic Madagascan clade that also includes the other four genera revised here.

### Synopsis of *Eutetramorium* species

*mocquerysi* Emery, 1899

*monticellii* Emery, 1899

*parvum* Bolton & Fisher sp. n.

### Key to *Eutetramorium* species (workers)

- 1 Much smaller, yellow species (Fig. 7), HW 0.56–0.59, SL 0.44–0.48, MfL 0.52–0.54. Eye relatively larger, EL/HW 0.24–0.25. Palp formula 4,2. Metatibia without a spur. . . . . *parvum*
- Much larger, darkly coloured species (Figs 1, 4), HW > 1.00, SL > 0.75, MfL > 1.00. Eye relatively smaller, EL/HW 0.17–0.22. Palp formula 4,3. Metatibia with a stout simple spur . . . . . 2
- 2 Dorsum of promesonotum and first gastral tergite with numerous suberect to decumbent setae present (Fig. 4). Propodeal spines short, in profile less than  $1.50 \times$  the maximum width of the propodeal lobe. Pronotal dorsum finely reticulate-rugose, the interspaces with some weak punctate ground sculpture (Fig. 6). . . . . *monticellii*
- Dorsum of promesonotum and first gastral tergite with minute appressed pubescence, without subdecumbent to decumbent setae (Fig. 1). Propodeal spines long, in profile obviously more than  $3.00 \times$  longer than the maximum width of the propodeal lobe. Pronotal dorsum coarsely shagreenate between foveate pits (Fig. 3) . . . . . *mocquerysi*

### Species of *Eutetramorium*

#### *Eutetramorium mocquerysi* Emery

(Figs 1–3, Map 123)

*Eutetramorium mocquerysi* Emery, 1899: 281, 2 figs. Lectotype and paralectotype workers, MADAGASCAR: Antongil, 1897–1898 (*A. Mocquerys*) (MSNG) [examined].

WORKER. TL 9.8–10.4, HL 2.08–2.18, HW 1.82–1.92, CI 86–89, SL 1.40–1.56, SI 76–83, PW 1.36–1.46, WL 2.84–3.04 (6 measured).



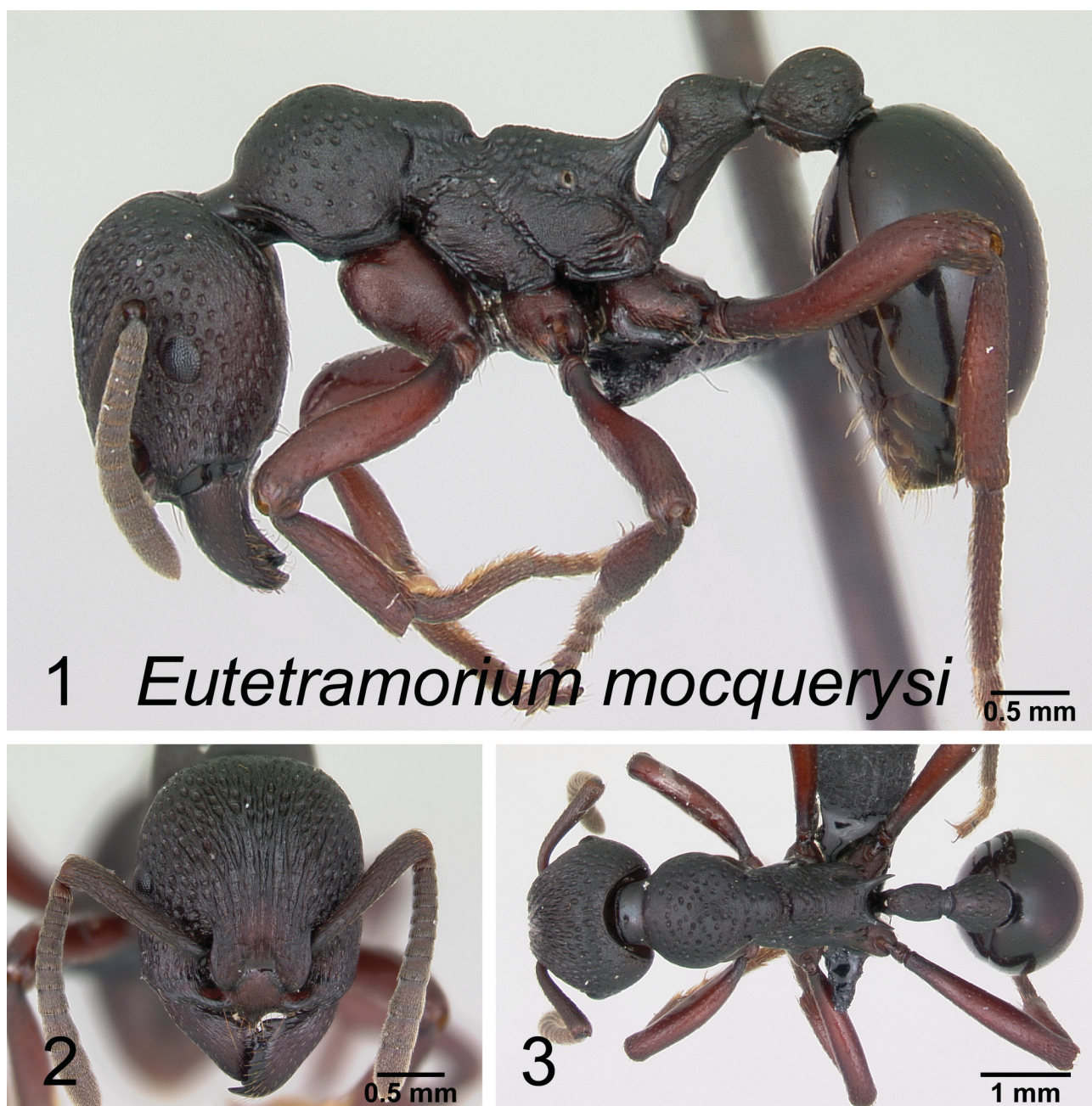
Palp formula 4,3. Mandible finely and densely longitudinally costulate. Cephalic dorsum longitudinally coarsely costate medially, the costae diverging posteriorly; spaces between costae with superficial ground sculpture. Sides of head with foveate pits, the spaces between which are densely shagreenate. Similar pits occur near the posterior margin of the dorsum. Eyes about at midlength of head in full-face view, EL 0.40–0.42 (EL/HW 0.21–0.22). Sides of head without projecting setae, but a few short coarse pubescence hairs may be present, appressed or nearly so. Mesotibia and metatibia each with a conspicuous simple spur. MfL 2.28–2.44 (MfL/HW 1.24–1.32). Legs covered with fine superficial reticular sculpture, superimposed upon which are scattered larger, shallow, semi-effaced punctures. Mesonotum in profile abruptly truncated posteriorly, descending almost vertically to the deeply impressed metanotal groove. Mesopleuron with a broad transverse sulcus that is unsculptured or very nearly so. Dorsal surfaces of entire mesosoma, petiole and postpetiole lack standing setae. Side of pronotum and entire dorsum of mesosoma foveate, the surfaces between foveae densely and strongly shagreenate. Propodeal spines long, slender and acute, in profile the spine 3.30–4.00 × longer than the maximum width of the propodeal lobe. Petiole in profile with a very small anteroventral process, spiracle located just anterior of the midlength of the peduncle. Postpetiole node broader than long, its width 0.70–0.74; dorsum of postpetiole shallowly foveate, the foveae less sharply defined than on the pronotum and the spaces between them punctulate-shagreenate. First gastral tergite with minute, superficial reticular patterning, and with scattered, minute, appressed pubescence, without setae. Full adult colour black, with dull brown to reddish brown legs.

QUEEN (gyne). Extreme ergatoid (e.g. CASENT0217042). Indistinguishable from worker without ovarian dissection.

MALE. See genus diagnosis of male above for main features. Smaller than worker, HL 1.44, HW 1.36, CI 94, SL 0.42, SI 31, PW 1.36, WL 2.64, MfL 2.08 (MfL/HW 1.53), EL 0.68 (EL/HW 0.50) (1 measured). Length of first funiculus segment 0.14, of second 0.40. Maximum length of petiole 0.60, of postpetiole 1.10; maximum width of postpetiole 0.57. Dorsum of head transversely costulate behind the ocelli. Mesoscutum irregularly finely rugulose; sculpture similar but more longitudinal on mesoscutellum. Legs densely minutely punctulate on almost all surfaces, but the posterior face of the metafemur more shiny and notably less densely sculptured than the anterior face.

This rainforest species is closely related to *monticellii* but easily separated from it by the keyed characters. In addition, *mocquerysi* is larger than *monticellii*, has slightly longer scapes, different sculpture, distinctly larger eyes (compare measurements), and has the first gastral tergite with superficial reticular patterning everywhere on the dorsum. *E. mocquerysi* has queens that cannot be distinguished from workers without ovarian dissections (Heinze et al. 1999). Based on the number of ovarioles, however, two types of females can be distinguished: females (queen) with six ovarioles and a spermatheca which can mate and produce diploid offspring and females (workers) with only two ovarioles and no spermatheca but can lay unfertilized eggs.

**Material examined. Madagascar:** Prov. Antsiranana, SSW Befingotra, Rés. Anjanaharibe-Sud (*B.L. Fisher*); S Andrakata (*B.L. Fisher*); Prov. Antsiranana, Parc National de Marojejy, Manantenina River, NE Andapa (*B.L. Fisher et al.*); Prov. Antsiranana, Marojejy R.N.I. #12 (*G.D. Alpert et al.*); Prov. Antsiranana, NNW Manantenina (*B.L. Fisher et al.*); Prov. Antsiranana, Parc National de Marojejy, Antranohofa, NNE Andapa (*B.L. Fisher et al.*); Prov. Antsiranana, NW Manantenina (*B.L. Fisher*); Prov. Antsiranana, Forêt de Binara, SW Daraina (*B.L. Fisher*); Betaolana forest, Ambodihazovolabe village along Ambolokopatrika river (*B.L. Fisher et al.*); Prov. Antsiranana, Makirovana forest (*B.L. Fisher et al.*); Galoko chain, Mont Galoko (*B.L. Fisher et al.*); Prov. Antsiranana, SAVA Region, distric of Sambava, Marojejy National Park, W of Manantenina village, 1st Camp site (Mantella) (*Rin'Ha, Mike*); Rés. Spéc. Marotandrano, Marotandrano, S Mandritsara (*J.C. Rakotonirina*); Réserve Spéciale Ambatovaky, Sandrangato river, (*B.L. Fisher et al.*); Prov. Toamasina, Manakambahiny Atsinanana (*A. Pauly*); Prov. Toamasina, Manakambahiny, near Vavatenina Forest (*A. Pauly*); Prov. Toamasina, Montagne d'Anjanaharibe, NNE Ambinanitelo (*Fisher, Griswold et al.*); prov. Toamasina, Montagne d'Akirindro, NNW Ambinanitelo (*Fisher, Griswold et al.*); Prov. Toamasina, Ankerana (*B.L. Fisher et al.*).



FIGURES 1–3. Lateral, full face and dorsal view of body. *Eutetramorium mocquersyi* worker CASENT0077435.

***Eutetramorium monticellii* Emery**  
(Figs 4–6, Map 124)

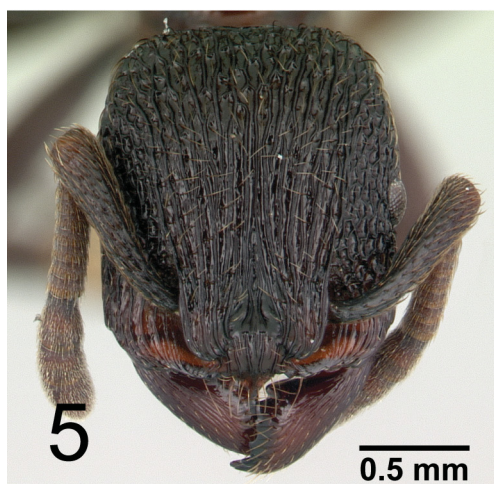
*Eutetramorium monticellii* Emery, 1899: 283. Holotype worker, MADAGASCAR: Antongil, 1897–1898 (*A. Mocquersyi*) (MSNG) [examined]. [Queen also briefly mentioned by Emery, 1899: 284, but excluded from type-series.]

WORKER. TL 7.8–8.0, HL 1.66–1.74, HW 1.40–1.52, CI 82–87, SL 1.02–1.08, SI 70–74, PW 1.00–1.06, WL 2.12–2.24 (6 measured).

Palp formula 4,3. Mandible finely and densely longitudinally costulate. Cephalic dorsum coarsely longitudinally costate medially, the costae weakly diverging posteriorly and with reticulation developed close to the posterior margin; spaces between costae with superficial ground sculpture. Sides of head reticulate-rugose, without shagreenate sculpture. Eyes at to slightly behind midlength of head in full-face view, EL 0.24–0.26 (EL/



HW 0.17–0.19). Sides of head without projecting setae, but short appressed pubescence usually present behind the eye. Mesotibia and metatibia each with a conspicuous simple spur. MfL 1.52–1.64 (MfL/HW 1.04–1.14). Legs covered with fine superficial reticular sculpture, superimposed upon which are scattered larger, shallow, semi-effaced punctures. Mesonotum in profile with a short truncation posteriorly, descending abruptly to the metanotal groove. Mesopleuron with only a vestige of a transverse sulcus, the area sculptured. Dorsum of promesonotum with subdecumbent to decumbent setae; without such setae on propodeum. Dorsa of petiole and postpetiole with setae similar to those on promesonotum. Side of pronotum and entire dorsum of mesosoma rugose to reticulate-rugose. Propodeal spines short, in profile the spine  $1.15\text{--}1.50 \times$  longer than the maximum width of the propodeal lobe. Petiole in profile with a low, carina-like anteroventral process, spiracle located just anterior of the level of the ascending face of the node. Postpetiole node  $0.58\text{--}0.62$  wide; dorsum of postpetiole reticulate-rugose. First gastral tergite with numerous decumbent setae, the surface of the sclerite glassy smooth except for setal pits. Full adult colour black.



FIGURES 4–6. Lateral, full face and dorsal view of body. *Eutetramorium monticellii* worker CASENT0007114.

QUEEN (gyne). Alate, larger than worker. TL 9.0–9.4, HL 1.92–2.04, HW 1.72–1.84, CI 89–90, SL 1.16–1.24, SI 66–67, PW 1.28–1.34, WL 2.67–2.72, MfL 1.80–1.88 (MfL/HW 1.02–1.05), EL 0.48 (EL/HW 0.26–0.28) (2 measured). Similar to worker but with a full complement of flight sclerites and well developed ocelli. The sculpture of the queen has a somewhat different orientation to that seen in the worker. The pronotum is transversely costate to rugose dorsally, near vertically so on the sides. On the propodeal dorsum the sculpture is strongly transverse, and on the mesoscutum is mostly reticulate, but has a distinct longitudinal component posteromedially.

MALE: unknown.

An inhabitant of rotten logs, both in rainforest and tropical dry forest, *monticellii* is easily separated from *mocquerysi* as, apart from the keyed characters, *monticellii* is smaller, has slightly shorter scapes, distinctly smaller eyes (compare measurements), has the first gastral tergite glassy smooth, and has different cephalic and mesosomal sculpture.

**Material examined.** Comoros: Mohéli, Ouallah (*B.L.Fisher et al.*). Madagascar: Prov. Antsiranana, Galoko chain, Mont Galoko (*B.L.Fisher et al.*); Parc National de Marojejy, Manantenina River (*B.L.Fisher et al.*); Prov. Mahajanga, Res. Bemarivo, SW Besalampy (*Fisher et al.*); Prov. Toliara, Rés. Ambohijanahary, NW Ambaravarana (*Fisher et al.*); 48km ENE Morondava (*G.D. Alpert et al.*).

### *Eutetramorium parvum* Bolton & Fisher sp. n.

(Figs 7–9, Map 125)

WORKER (holotype in parentheses). TL 2.7 (2.7), HL 0.64–0.66 (0.64), HW 0.56–0.59 (0.59), CI 88–92 (92), SL 0.44–0.48 (0.46), SI 78–81 (78), PW 0.38–0.42 (0.40), WL 0.70–0.73 (0.72) (4 measured).

Palp formula 4,2. Cephalic dorsum extremely finely, densely, longitudinally costulate, the costulae diverging and becoming weaker posteriorly; spaces between costulae finely punctulate. Eyes slightly in front of midlength of head in full-face view, EL 0.14–0.15 (EL/HW 0.24–0.25). Sides of head without projecting setae except for a single short seta at the posterior corner. Dorsum of head with a few short, standing setae, and sparse decumbent pubescence. Mesotibia and metatibia without spurs (or spurs so reduced that they cannot be distinguished from apical setae by light microscopy). Metafemur short, MfL 0.52–0.54 (MfL/HW 0.90–0.93). Mesosoma in profile with metanotal groove impressed, the outline of the propodeum just behind the groove rising to a peak, then sloping posteriorly to the spines. Promesonotal dorsum with sparse, short setae. Propodeal dorsum with setae on the crest immediately behind the metanotal groove, but otherwise absent. Pronotal dorsum very finely reticulate-rugulose, the spaces between the rugulae densely punctulate. Petiole in profile with an angulate anteroventral process that is followed by a cuticular crest which extends back to the level of the spiracle; the latter located just anterior to the ascending face of the node. In dorsal view nodes of both petiole and postpetiole broader than long, the postpetiole with length *ca* 0.20, width *ca* 0.26. Setae on dorsum of first gastral tergite numerous, short and subdecumbent. First gastral tergite unsculptured except for small pits from which the setae arise. Full adult colour dull yellow to light brownish yellow.

QUEEN (gyne). Presumed alate when virgin, the single specimen known is dealate. TL 3.6, HL 0.75, HW 0.71, CI 95, SL 0.52, SI 73, PW 0.56, WL 1.00, MfL 0.64 (MfL/HW 0.90), EL 0.22 (EL/HW 0.31) (1 measured). Postpetiole dorsal length 0.28, width 0.34. As worker but larger, with conspicuous ocelli and a full complement of flight sclerites. First gastral tergite much broader than in worker (0.87 as opposed to worker *ca* 0.56). Mesoscutum and scutellum longitudinally costulate.

ERGATOID? A single specimen in the type-series basically resembles a worker, but is decidedly larger, TL 3.0, HL 0.71, HW 0.64, CI 90, SL 0.49, SI 77, PW 0.46, WL 0.82, MfL 0.60 (MfL/HW 0.94), EL 0.16 (EL/HW 0.25). Postpetiole dorsal length 0.24, width 0.28. Otherwise the same as the paratype workers; without flight sclerites but mesonotum more prominent and better defined than in the genuine workers. Maximum width of first gastral tergite 0.64 (*ca* 0.56 in worker and 0.87 in queen).

As so few specimens are known it is not possible to tell if this individual represents a larger caste of worker, a worker-queen intercaste, or an ergatoid form. Fresh material will be needed, so that this form can be dissected to assess the condition of the ovaries and establish whether spermathecae are present.

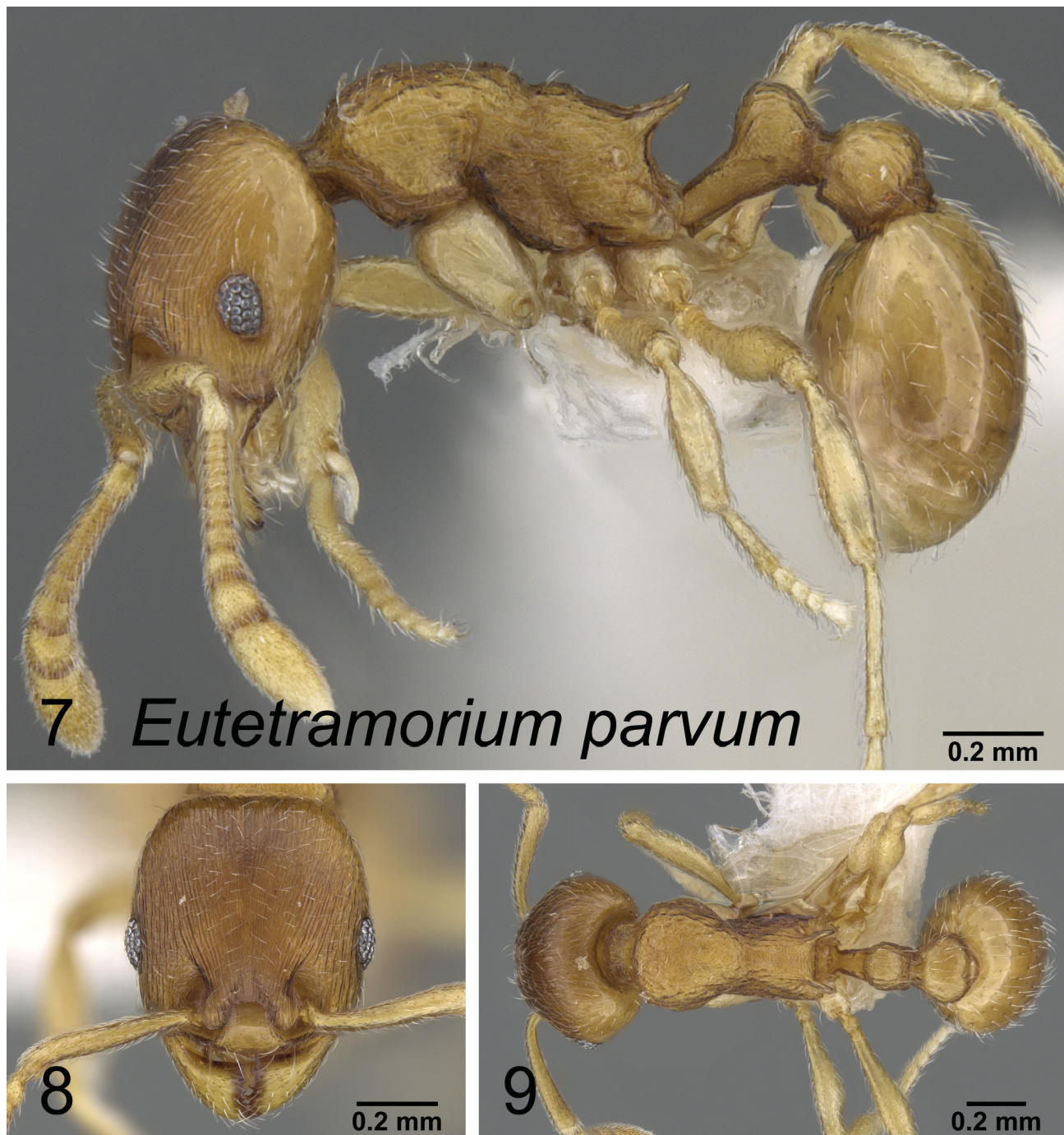
MALE: unknown.



Holotype worker (top specimen of 3 on pin), **Madagascar**: Prov. Toliara, Chaines Anosyennes, Massif Nord, zone summitale, 1900 m., 20.ii.1971, JMB 2048, 2048.8674w, CASENT0195002 (*Peyrieras*) (CASC).

Paratypes. 4 workers (2 on same pin as holotype), 1 possible ergatoid (see above), 1 dealate queen (gyne); with same data as holotype but the pin bearing the dealate queen with a label, “lavage de sol et litiere. Foret dense humide de montagne” (CASC). [A number of specimens from the same series, in BMNH, are also to be regarded as paratypes.]

Known only from the type-series, *parvum* is easily distinguished from the two previously known species as it is very small by comparison, is yellow, has a reduced palp formula, is more finely sculptured, lacks mesotibial and metatibial spurs, and despite its small size has eyes that are relatively larger than in its congeners.



FIGURES 7–9. Lateral, full face and dorsal view of body. *Eutetramorium parvum* holotype worker CASENT0195002.

## Genus *Malagidris*

(Figs 10–29, Maps 126–131)

### *Malagidris* Bolton & Fisher nom. n.

*Brunella* Forel, 1917: 234. Type-species: *Aphaenogaster belti* Forel, 1895: 248, by monotypy. (Junior synonym of *Aphaenogaster* Mayr, 1853: 107; Bolton, 1982: 341; revived from synonymy here.) [Junior homonym of *Brunella* Smith, G.W. 1909: 87 (Crustacea).]

### Diagnosis of worker

Monomorphic myrmicine ants.

Mandible triangular; masticatory margin with 8–13 teeth, longer than the basal margin.

Palp formula 5,3.

Stipes of maxilla with a weak transverse crest.

Clypeus posteriorly moderately broadly inserted between the frontal lobes (width of clypeus between the lobes as great as or greater than width of one of the lobes); median portion of clypeus longitudinally costulate, not bicarinate.

Clypeus with a stout unpaired seta at the midpoint of the convex anterior margin.

Frontal carinae short, restricted to well defined but narrow frontal lobes.

Antennal scrobes absent.

Antenna with 12 segments, with an apical club of 3 segments that may be very slender.

Torulus with upper lobe visible in full-face view; maximum width of torulus lobe is just posterior to the point of maximum width of the frontal lobes.

Eyes present, located in front of the midlength of the head capsule in full-face view.

Head capsule without a median, longitudinal carina; occipital carina conspicuous.

Promesonotal suture absent; pronotal humeri weakly angulate.

Pronotum plus anterior mesonotum swollen and distinctly convex in profile; dorsalmost point of promesonotum at a considerably higher level than the long propodeal dorsum.

Propodeum bispinose; propodeal lobes rounded.

Propodeal spiracle behind midlength of sclerite, at about midheight of side of propodeum and far in front of the margin of the declivity; spiracle separated from apex of metapleural gland bulla by at least one spiracle diameter.

Metasternal process obsolete, at most a narrow crest on each side of the metasternal pit, each crest sometimes extended posteriorly as a narrow carina.

Legs long and slender.

Tibial spurs: mesotibia 1; metatibia 1, both simple.

Abdominal segment 2 (petiole) with a long, slender anterior peduncle; spiracle slightly in front of the midlength of the peduncle.

Abdominal segment 2 node short, rounded to subconical in profile.

Subpetiolar process an anteroventral denticle.

Abdominal segment 3 (postpetiole) elongate, not dorsoventrally flattened, not markedly broader than high; ventral surface in profile flat to shallowly convex.

Stridulitrum present on pretergite of abdominal segment 4.

Abdominal tergite 4 (first gastral) does not broadly overlap the sternite on the ventral gaster; gastral shoulders absent.

Sting strongly developed, simple.

Main pilosity of dorsal head and body: simple, often sparse, usually absent from propodeal dorsum.

### Diagnosis of queen (gyne)

This caste is alate in *belti*, ergatoid in *alperti*, *jugum* and *sofina*, and remains unknown in *dulcis* and *galokoa*. The alate queen matches the description of the worker except for its conspicuous ocelli and the structure of the enlarged mesosoma, where there is a full complement of flight sclerites and a broad sulcus across the mesopleuron. The ergatoid forms match the definition of the worker but with ocelli variably developed. In *alperti* and the single known ergatoid of *jugum* ocelli are absent, although a vague pit-like depression in one *alperti* ergatoid may indicate the last vestige of the median ocellus. Among the known ergatoids of *sofina* some retain three distinct ocelli, while others exhibit only a reduced median ocellus. The mesonotum is somewhat larger and better defined than in the worker, with a fully fused but more obvious promesonotal suture across the dorsum. The mesopleuron shows a reduced or absent transverse sulcus. The propodeal spines are shorter and stouter than in the respective workers, the postpetiole is more swollen and the gaster is more voluminous. Venation: see under male.



## Diagnosis of male

Males taken in association with workers are known for *alperti*, *belti*, *jugum* and *sofina*. In addition, males of two more species that appear to belong in this genus are known. One of them is tentatively associated with *dulcis* here, but this remains to be confirmed; the other does not associate with any known worker but appears morphologically closest to *jugum*, it is discussed there. Slightly smaller than conspecific worker. Mandible triangular and strongly dentate, with 6–11 sharp teeth. Palp formula 5,3. Stipital crest present on maxilla. Antenna with 13 segments, long and filiform. SI 42–79. First funicular segment short, not globular, about one quarter to one half the length of the second funicular segment. In full-face view eye located in front of midlength of head capsule. Ocelli conspicuous. Occipital carina sharp, forming a distinct crest. Mesotibia and metatibia each with a single simple spur. Notauli very reduced or absent. Mesopleuron with a marked transverse sulcus. Mesoscutum convex in profile, the mesoscutum and mesoscutellum elevated, much higher than the propodeal dorsum, which is depressed and slopes downward posteriorly. Propodeum unarmed, the spiracle high on the side and at about the midlength, or slightly in front of the midlength, of the sclerite; propodeal lobes conspicuous, rounded. Petiole with a long anterior peduncle and a low node, the spiracle at or behind the midlength of the peduncle, but in front of the level of the node. Subpetiolar process present, small. Parameres large. Cerci present.

Forewing venation (based on males as available *belti* queen specimens are dealate).  $Rs \cdot f4-5$  does not meet  $R \cdot f3$  on anterior margin of wing (= marginal cell open).  $2rs-m$  absent.  $1m-cu$  present. Fusion of  $Rs+M$  extended distally, so that  $1m-cu$  arises from  $Rs+M$ , not from  $M$ .  $Rs \cdot f3$  absent ( $Rs+M$  divides into  $Rs \cdot f4-5$  and  $M \cdot f3-4$  at or distal of the junction with  $2r-rs$ ).  $A \cdot f2$  a mere stub distal of  $cu-a$ ; the latter is retracted and arises from  $M+Cu$ , proximal of the point where it divides into  $M \cdot f1$  and  $Cu \cdot f1-2$ .

## Comments on *Malagidris*

The type-species of this genus, *belti* (Forel, 1895), has had a moderately varied taxonomic history. It was originally described in the genus *Aphaenogaster* Mayr (1853), even though Forel remarked on its 3-segmented antennal club, rather than 4 as is usual in that genus. This character, coupled with the presence of angulate humeri and a queen with a depressed mesosoma, caused Emery (1915a: 68) to exclude *belti* from *Aphaenogaster* and transfer it to *Atopula* Emery (1912). Forel (1917: 234) decided that *Atopula* was artificial, “composed of disparate species,” and established the genus *Brunella* to include only *belti*. The component species of *Atopula* were later dispersed to other genera by Bolton (1976: 362), who retained genus *Brunella* as its “affinities are unclear.” Later however, Bolton (1982: 341) synonymised *Brunella* under *Aphaenogaster*, thus returning *belti* to its original generic combination.

Extensive recent sampling of the Madagascan ant fauna by Brian Fisher and associates has made it clear that this synonymy was incorrect. The discovery of several species referable to Forel’s *Brunella* has allowed the diagnosis of a distinct group of Madagascan endemics, which are convergent in some characters with *Aphaenogaster* but certainly not congeneric with it. The final act of this history has been the realisation that *Brunella* Forel (1917) is the junior homonym of a crustacean genus *Brunella* G.W. Smith (1909), from Tasmania. No replacement name was essential for *Brunella* Forel while it was a junior synonym, but now that it is revived from synonymy a replacement name is necessary: *Malagidris* nom. n.

The larger, more gracile species (e.g. *alperti*, *galokoa*, *jugum*, *sofina*) of *Malagidris* are remarkably convergent on the widely distributed genus *Aphaenogaster*. However, all species of *Malagidris* have two critical features never exhibited by *Aphaenogaster* species. First, the midpoint of the anterior clypeal margin of *Malagidris* has a single, stout, unpaired seta. In *Aphaenogaster* there is always a conspicuous pair of setae, one on each side of the midpoint of the anterior clypeal margin. Second, *Aphaenogaster* species do not have the characteristic structure of the anteroventral peduncle of the petiole, as described under the definition of *Eutetramorium* group. In addition to these, *Malagidris* always has the following: a transverse crest present on the stipes of the maxilla; a 3-segmented antennal club; a subpetiolar process present; a strongly developed sting; the anterior clypeal margin convex at the midpoint. In *Aphaenogaster*, by contrast, the stipes usually lacks a crest (a crest is incompletely and weakly developed in a few species, strong only in *A. relictus* Wheeler & Mann, from Haiti, which may not be properly referable to *Aphaenogaster*), usually has a 4-segmented antennal club (5-segmented to gradually incrassate in some species but never 3-segmented), lacks a subpetiolar process, has a very weakly developed or vestigial sting, and usually (but not always) has the midpoint of the anterior clypeal margin concave or indented.

## Synopsis of *Malagidris* species

*alperti* Bolton & Fisher **sp. n.**

*belti* (Forel, 1895)

*dulcis* Bolton & Fisher **sp. n.**

*galokoa* Bolton & Fisher **sp. n.**

*jugum* Bolton & Fisher **sp. n.**

*sofina* Bolton & Fisher **sp. n.**

## Key to *Malagidris* species (workers)

- 1 Head relatively broad (CI 81–84). Scape relatively short (SI 97–108); when scape laid straight back on head, in full-face view, its apex reaches, or fractionally exceeds, the posterior margin (Fig. 14). Metafemur relatively short, MfL/HW 1.25–1.35. Subpetiolar process subtended by a narrow cuticular crest that extends posteriorly beyond the level of the spiracle . . . . . ***belti***
- Head relatively narrow (CI 56–74). Scape relatively long to extremely long (SI 145–231); when scape laid straight back on head, in full-face view, its apex very conspicuously surpasses the posterior margin. Metafemur relatively long, MfL/HW 1.70–3.13. Subpetiolar process not subtended by a cuticular crest. . . . . 2
- 2 More densely setose species: in full-face view 4–5 setae project from side of head behind eye, and in addition 1–2 project out from below the eye (Fig. 17); a pair of setae present in the metanotal groove, and at least 1 pair of setae on propodeal dorsum (Fig. 16). Metafemur relatively shorter, MfL/HW 1.70–1.83, in anterior or posterior view relatively more stout, MfL/MfH 4.60–5.50. . . . . ***dulcis***
- Less densely setose species: in full-face view 0–3 setae project from side of head behind eye, setae never project out from below the eye; without setae in the metanotal groove, and propodeal dorsum without setae. Metafemur relatively longer, MfL/HW 1.95–3.20, in anterior or posterior view relatively slender, MfL/MfH 5.77–12.29. . . . . 3
- 3 Scape extremely elongated, SI 201–231; head relatively narrow, CI 56–62 (Fig. 26); metafemur relatively very long and slender, MfL/HW 2.81–3.20, MfL/MfH 10.24–12.29. Pronotal dorsum predominantly very densely reticulate-punctulate (Fig. 27), also with minute, low, weak disorganised rugulae, but the rugulose sculpture is secondary to the reticulate-punctulate component. . . . . ***sofina***
- Scape shorter, SI 160–192; head relatively broader, CI 65–73; metafemur relatively shorter and deeper, MfL/HW 1.95–2.65, MfL/MfH 5.77–8.92. Pronotal dorsum predominantly reticulate-rugose; spaces between the rugae smooth, or with punctulate ground sculpture, any punctulae present are usually distinctly secondary to the rugose component. . . . . 4
- 4 Propodeal spines very broad basally, extremely elevated, and so strongly recurved that their apices are directed anterodorsally (Fig. 19). Smaller species, HW 0.72–0.78, SL 1.20–1.30, MfL 1.42–1.54 . . . . . ***galokoa***
- Propodeal spines straight to feebly sinuate, never recurved so that their apices point anterodorsally. Larger species, HW 0.82–1.12, SL 1.45–1.98, MfL 1.86–2.76. . . . . 5
- 5 Median clypeal seta arises from a prominent, raised, false anterior margin (Fig. 22), below which is a vertical or reflexed section of the clypeus that descends to the true anterior margin; outline of clypeus in profile is roughly an anteriorly-directed V-shape. Pronotal dorsum usually with 1–2 pairs of setae present. Side of head in front of eye with a single projecting seta (rarely absent), side behind eye with 1–3 projecting setae (Fig. 23). With head in profile the dorsum above the eye flat or very nearly flat, without a distinct concave impression or indentation . . . . . ***jugum***
- Median clypeal seta does not arise from a raised false anterior margin (Fig. 10); outline of clypeus in profile is more or less evenly convex. Pronotal dorsum usually without setae. Side of head, both in front of and behind the eye, without projecting setae (Fig. 11). With head in profile the dorsum above the eye distinctly indented and concave, the outline of the impression rising posteriorly to the highest point of the vertex . . . . . ***alperti***

## Provisional key to males of *Malagidris* species

- 1 With petiole in dorsal view the peduncle with a pair of laterally projecting tubercles, upon which the spiracles are borne; width across the tubercles is distinctly greater than the maximum width across the node . . . . . 2
- With petiole in dorsal view the peduncle with a slight convexity at the site of the spiracles, without tubercles; width across the convexity is less than the maximum width across the node . . . . . 3



- 2 Postpetiole in dorsal view and in profile longer and more slender, length/width *ca* 1.90 or more, length/height > 2.00. Head longer and narrower, CI < 80. Larger species, HW > 0.80, MfL > 1.80. . . . . **jugum**
- Postpetiole in dorsal view and in profile shorter and more stout, length/width *ca* 1.25, length/height *ca* 1.43. Head shorter and broader, CI 84. Smaller species, HW 0.72, MfL *ca* 1.10 . . . . . **unassociated male** (discussed under *jugum*)
- 3 With head in profile the posterodorsal outline, behind the ocelli, vertical or very nearly vertical. Head relatively broader, CI 80–84. . . . . 4
- With head in profile the posterodorsal outline, behind the ocelli, conspicuously sloped to the posterior margin, not vertical. Head relatively narrower, CI 67–74. . . . . 5
- 4 With head in profile the vertical posterior surface terminates ventrobasally in a posteriorly projecting lobe, which has the occipital carina at its apex. Eye relatively slightly larger, EL/HW 0.58–0.61 . . . . . **belti**
- With head in profile the vertical posterior surface descends directly to the occipital carina, without a posteriorly projecting lobe. Eye relatively slightly smaller, EL/HW 0.50 . . . . . **dulcis** (putative)
- 5 Scape relatively short, SI 45–48. First funicular segment of antenna relatively long, length of first segment/length of second segment 0.38–0.40. Smaller species, HW < 0.70, MfL < 1.50, maximum width of mesoscutum < 0.75 . . . . . **alperti**
- Scape relatively long, SI 77–79. First funicular segment of antenna relatively very short, length of first segment/length of second segment 0.23–0.26. Larger species, HW > 0.70, MfL > 1.90, maximum width of mesoscutum > 0.85. . . . . **sofina**

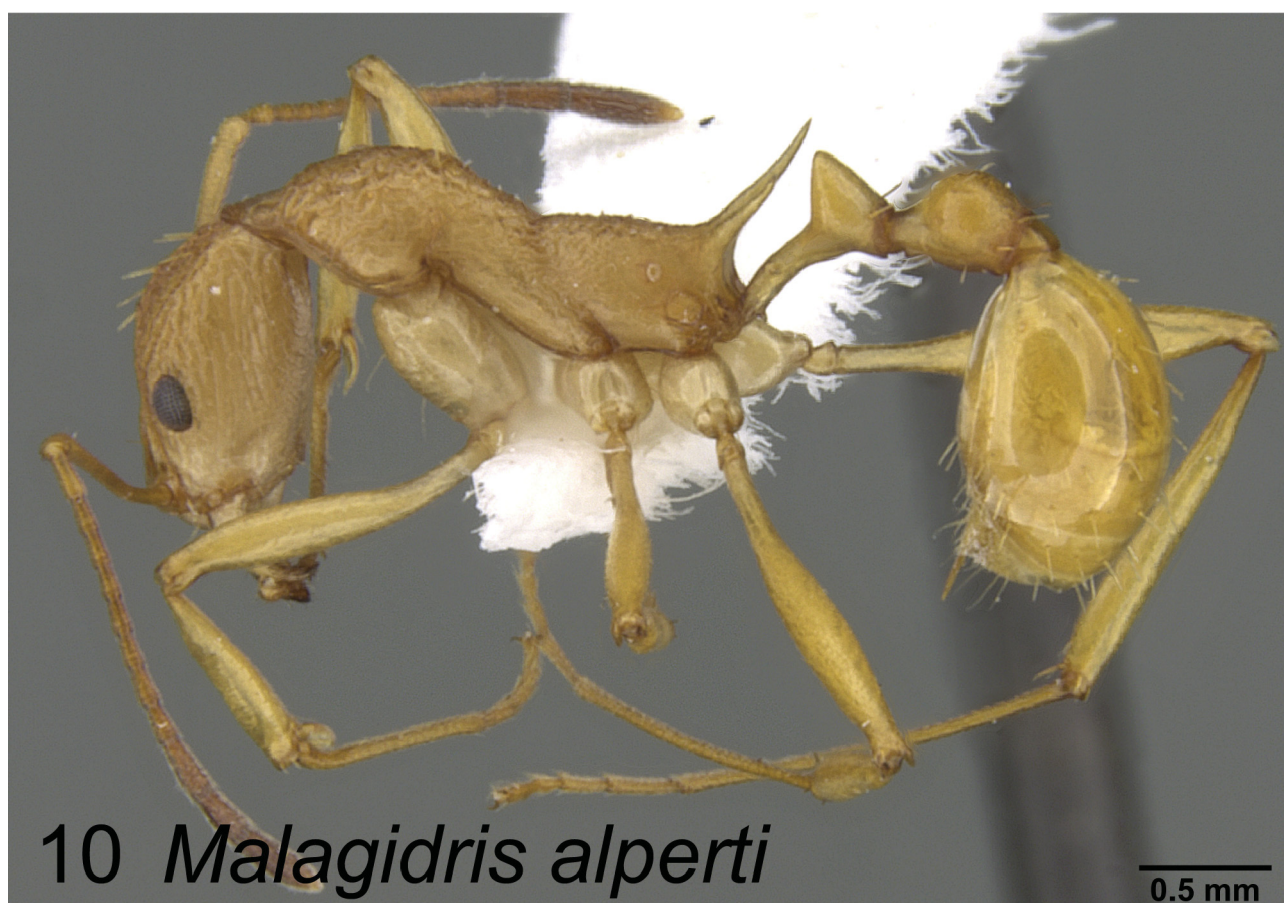
## Species of *Malagidris*

### *Malagidris alperti* Bolton & Fisher sp. n.

(Figs 10–12, Map 126)

WORKER (holotype in parentheses). TL 5.8–6.5 (5.8), HL 1.22–1.34 (1.22), HW 0.82–0.96 (0.82), CI 65–72 (67), SL 1.45–1.61 (1.52), SI 160–192 (185), PW 0.68–0.82 (0.69), WL 1.80–1.90 (1.82) (18 measured).

Mandible with 10–12 teeth and denticles in total, finely longitudinally costulate. Median clypeal seta stout, in dorsal view not arising from a tubercle at the midpoint of the anterior margin. In profile the clypeal outline is more or less evenly convex from apex to base, without an elevated false anterior margin that is subtended by a vertical or reflexed section of the clypeus that descends to the true anterior margin. In profile the median clypeal seta arises from just above the anterior margin of the clypeus. Scapes long (SI 160 or more), with minute pubescence but lacking standing setae. Club segments of funiculus long and slender, distinctly longer than broad. EL 0.22–0.24 (EL/HW 0.25–0.29). With head in profile the dorsal outline above and behind the eye is obviously concave to distinctly indented; posteriorly the outline of the concavity rises to the highest point of the vertex. With head in full-face view sides behind the eyes elongate, shallowly convex and weakly convergent posteriorly, passing into the posterior margin through a short angle; posterior margin shallowly concave and the occipital carina raised into a translucent cuticular flange that is widest medially. Dorsum of head predominantly longitudinally rugose, with occasional anastomoses; posteriorly the number of anastomoses increases. Spaces between the rugae reticulate-punctulate, usually more strongly so on the anterior half. Ventral surface of head with superficial rugulae. Dorsum of mesosoma sharply rugose, the strongest rugae transverse on pronotal disc and with some reticulation; spaces between the rugae mostly smooth, not reticulate-punctulate. In dorsal view the lower sides of the pronotum are flared outward above the coxal articulations, so that the maximum pronotal width, across the flared portion, is greater than across the humeri. Propodeal spines long in profile (0.48–0.58); propodeal declivity unsculptured. Side of mesosoma rugose to reticulate-rugulose, but not as strongly sculptured as the dorsum; sculpture partially to mostly effaced on mesopleuron and metapleuron. Metafemur long and slender, MfL 1.86–2.00 (MfL/HW 1.96–2.41, MfL/MfH 6.30–8.30). Peduncle of petiole long and slender, downcurved in profile and with a small, dentiform anteroventral process. Subpetiolar process not followed by a cuticular crest along the mid-ventral surface of the peduncle. Petiole node in profile narrowly conical, vertical to slightly inclined anteriorly; acute apically. In posterior view the sides of the petiole node converge in their upper halves, the short apical margin is narrowly rounded to flattened. Petiole node with faint superficial punctulate sculpture, almost effaced in some. Postpetiole in profile convex dorsally, about 1.20–1.48 times longer than high; in dorsal view distinctly longer than broad; maximum dorsal width of postpetiole 0.37–0.46, very slightly less than its height. Dorsum of postpetiole node finely punctulate and with a few weak superficial rugulae. Base of first gastral tergite at most with superficial basigastral costulae, sometimes entirely effaced; tergite otherwise unsculptured.



FIGURES 10–12. Lateral, full face and dorsal view of body. *Malagidris alperti* holotype worker CASENT0170928.

Pilosity: with head in full-face view the side, both in front of and behind the eye, without projecting setae; with head in profile the dorsum behind the highest point with 2–3 pairs of setae that are inclined anteriorly, followed by a transverse row of 4 setae closest to the posterior margin (rarely this row is reduced to a widely separated pair, or is absent); pronotal dorsum without setae; mesonotum anteriorly with 1 pair, without setae at the metanotal groove; propodeal dorsum lacks setae; ventral surface of metafemur lacks setae; petiole node with a pair of setae on its posterior face; postpetiole with 1 pair dorsally and with a transverse row of 4 posteriorly; gaster with numerous short simple setae. Full adult colour yellow to light orange-yellow.

QUEEN (gyne). Ergatoid (e.g. CASENT0248384). TL 6.8, HL 1.28, HW 0.93–0.97, CI 73–76, SL 1.35–1.38, SI 142–145, WL 1.72–1.74, MfL 1.70–1.72, MfL/HW 1.77–1.83, MfL/MfH 7.17–7.53. EL 0.24–0.25 (EL/HW



0.26) (2 measured). Propodeal spine length *ca* 0.46, but the spines stouter than in the worker. Postpetiole length 0.60, width 0.58–0.60, height 0.60–0.63. Maximum width of first gastral tergite 1.50–1.60 (as opposed to < 1.30 in worker). Most dimensions are within the worker ranges, but the scape is relatively shorter, and the metafeum is both absolutely and relatively shorter. In general the ergatoid matches the worker description, but the pronotal sculpture is more sharply reticulate-rugose, and the humeral angles are more pronounced. Pilosity as worker but head without the posterior transverse row (this may have been abraded away in the single specimen available). Ocelli absent or at most with a pit-like vestige of the median ocellus among the cephalic sculpture.

MALE. Mandible with 8–9 sharp teeth. CI 73–74, SI 45–48, MfL *ca* 1.25 (2 measured). First funicular segment of antenna less than 0.50 times the length of the second segment. EL/HW 0.45–0.46. With head in profile the dorsal outline behind the posterior ocelli slopes down to the occipital carina, the surface not vertical immediately behind the ocelli. With mesosoma in dorsal view the pronotum forms a visible anterior arc in front of the mesoscutum. Notauli absent. Peduncle of petiole with spiracles borne on low prominences, in dorsal view the distance across them slightly less than the maximum width of the node. Postpetiole in dorsal view slender, 1.89–1.92 × longer than broad.

Three males are known, all from the Andrakaraka series noted below (CASC). In all of them the metatibiae are strangely deformed, and in most there is some degree of deformity to the femora, tibiae and basitarsi of the middle and hind legs. It is not considered that this is a normal morphological character, but rather is the result of a genetic aberration or the result of parasitoid attack in a pre-imaginal stage. The deformities are not seen in any workers or ergatoids from the same series.

Holotype worker, **Madagascar**: 5 km. SW Antalaha [Prov. Antsiranana], 50 m., 14°56'17"S, 50°15'42"E, 27.ii.1991. Secondary forest, foraging on ground. 4470w. *Aphaenogaster* sp. 1, det. Alpert, 1994. DNA. CASENT0170928 (*G.D. Alpert*) (CASC).

Paratypes. 14 workers with same data as holotype, but coded: 2 workers .2377w, 10.ii.1991; 2 workers .4469w, 11.ii.1991, CASENT0170958; 1 worker .4628w, 27.ii.1991, CASENT0170958; 1 worker .6255w, 5.iii.1991, CASENT0195178; 1 worker .4342w, 15.vii.1992, CASENT0195174; 2 workers .4343w, 17.ii.1992; 2 workers .4344w, 17.ii.1992; 1 worker .4345, 17.viii.1992, CASENT0171929; 1 worker .4338w, 26.i.1993; 1 worker .4339w, 26.i.1993 (CASC, BMNH).

*M. alperti* has a large, slender, relatively heavily sculptured worker which most closely resembles *jugum* in terms of habitus, relative dimensions and mesosomal sculpture. The main differences between them include the profile shape of the clypeus, which has a prominent and elevated false anterior margin in *jugum* but not in *alperti*; indentation of the cephalic dorsum, which is conspicuous in *alperti* but minimal or absent in *jugum*; and aspects of their pilosity, for instance the absence of projecting setae on the sides of the head in *alperti*, contrasting with their presence in *jugum*.

This species has been found only in lowland secondary forest and littoral forest, where it forages on the ground.

**Non-paratypic material examined.** **Madagascar**: 8 km. SW Cap Est (*G.D. Alpert*); 10 km. S Cap Est (*G.D. Alpert*); Andrakaraka (*B.L. Fisher et al.*).

### ***Malagidris belti* (Forel) comb. n.**

(Figs 13–15, Map 127)

*Aphaenogaster belti* Forel, 1895: 248. **Lectotype** worker, by present designation [top worker of two specimens on pin, now coded CASENT0101063 and imaged on Antweb], MADAGASCAR: Moramanga (*Sikora*) (MHNG) [examined].

*Atopula belti* (Forel); Emery, 1915a: 68 (combination).

*Brunella belti* (Forel); Forel, 1917: 234 (combination).

*Aphaenogaster belti* Forel; Bolton, 1982: 341 (combination).

WORKER. TL 4.9–5.4, HL 1.02–1.20, HW 0.83–0.99, CI 81–84, SL 0.90–0.97, SI 97–108, PW 0.60–0.69, WL 1.38–1.56 (10 measured).

Mandible usually with 8 teeth and denticles in total, less commonly with 7 or 9; with fine longitudinal costulae basally, but costulae becoming superficial and fading out towards the masticatory margin. Median portion of clypeus slopes evenly to a narrow anterior cuticular apron; median clypeal seta arises from just above midpoint of anterior margin. Median portion of clypeus with a number of weak longitudinal rugulae. Scapes of moderate length (SI < 110), with fine decumbent to appressed pubescence but lacking standing setae; when laid straight back in full-

face view the apex of the scape reaches, or just exceeds, the posterior margin. Club segments of funiculus longer than broad, but not remarkably attenuated. EL 0.21–0.26 (EL/HW 0.25–0.27), with 11–12 ommatidia in the longest row. With head in full-face view the sides behind the eyes shallowly convex, rounding broadly and evenly into the posterior margin, the latter more or less transverse to shallowly convex medially. Dorsum of head longitudinally rugose, the rugae strongest medially, weaker and less regular dorsolaterally, and with a few weak anasomoses, especially posteriorly; spaces between the rugae reticulate-punctulate. Ventral surface of head longitudinally costulate to rugulose, those closest to the ventral midline converging anteriorly. Dorsum of mesosoma reticulate-rugose; punctulate ground sculpture between the rugulae much less conspicuous than on the head, effaced in places. In dorsal view pronotum broadest behind the angulate humeri. Propodeal spines in dorsal view distinctly separated basally, in profile short (0.16–0.23). Propodeal declivity unsculptured. Side of mesosoma reticulate-rugose on pronotum and propodeum, but longitudinally rugose on mesopleuron. Metafemur relatively short, MfL 1.12–1.28 (MfL/HW 1.25–1.35), quite deep in posterior view (MfL/MfH 4.62–5.22). Peduncle of petiole in profile slightly longer than the node and with a small, dentiform anteroventral process. Subpetiolar process followed by a low cuticular crest along the mid-ventral surface of the peduncle, that extends back beyond the spiracle. Petiole node in profile narrowly rounded apically. In posterior view the sides of the petiole node weakly convergent in their dorsal halves, and merging into an evenly rounded dorsal outline. Petiole node with superficial remnants of punctulate sculpture. Postpetiole in profile convex dorsally, 1.21–1.37 times longer than high; in dorsal view postpetiole slightly longer than broad, maximum width 0.36–0.43; maximum dorsal width of postpetiole (0.36–0.43) slightly greater than its height. Dorsum of postpetiole node superficially reticulate-punctulate and sometimes with a few vestiges of minute rugulae; sculpture strongest posteriorly. Extreme base of first gastral tergite with short, inconspicuous basigastral costulae; remainder of tergite unsculptured except for setal pits.

Pilosity: with head in full-face view the side in front of the eye with 0–1 projecting setae, behind eye with 0–1 setae; with head in profile the dorsum behind the highest point with 3–5 pairs of setae (sometimes 3–5 short transverse rows of 4 setae) that are inclined anteriorly, dorsum closest to the posterior margin with a transverse row of 4–6 setae; pronotal dorsum with 2–4 setae anteriorly and 1 pair (rarely 2 pairs) very close to the junction with the mesonotum; mesonotum with 3 pairs and usually also with a short pair at the metanotal groove; propodeal dorsum lacks setae; ventral surface of metafemur usually without setae but sometimes with one present, close to the trochanter; petiole node with a pair of setae on its posterior face, and sometimes also with a posterobasal pair; postpetiole with 1–2 pairs dorsally and with a transverse row of 4 posteriorly; gaster with numerous short, simple setae. Full adult colour orange-brown to reddish.

QUEEN (gyne). Alate, with conspicuous ocelli and a broad transverse mesopleural sulcus. TL 6.0–6.2, HL 1.16–1.25, HW 1.00–1.08, CI 86, SL 0.98, SI 91–98, PW 0.75–0.82, WL 1.74–1.76, MfL 1.26–1.35, MfL/HW 1.25–1.26, MfL/MfH 4.50–5.25. EL 0.29–0.30 (EL/HW 0.28–0.29) (2 measured). Mesoscutum width 0.80–0.83, length 0.76–0.84. Postpetiole length 0.50–0.54, width 0.48–0.50, height 0.44–0.46. Most dimensions are slightly greater than the worker ranges, but the scape is relatively slightly shorter. Cephalic pilosity as worker but pronotum with 1 lateral pair and a transverse row of 4 posteriorly, just in front of the anterior margin of the mesoscutum; mesoscutum with about 16–18 setae, mesoscutellum with 2–4, metanotum with 2; setae absent from propodeum.

MALE. Mandible with 6–8 sharp teeth. CI 78–82, SI 58–59, MfL *ca* 1.20 (2 measured). First funicular segment of antenna 0.42–0.50 × the length of the second segment. EL/HW 0.58–0.61. With head in profile the dorsal outline behind the posterior ocelli descends vertically to the occipital carina, which is borne on a posteriorly projecting prominence or lobe. With mesosoma in dorsal view the arc of the pronotum is concealed medially by the anterior bulge of the mesoscutum. Notauli with anterior portions discernible, but shallow and almost effaced. Peduncle of petiole with spiracles not borne on tubercles, in dorsal view the maximum width of the petiole is across the node. Postpetiole in dorsal view only 1.24–1.29 × longer than broad.

Within the genus, the worker of *belti* is quickly diagnosed by its relatively broad head (CI 81–84) and short scapes (SI 97–108), their relative dimensions obviously different from all the other species, which have narrower heads (CI < 75) and more attenuated scapes (SI > 140). In addition, the ventral surface of the petiole has a median longitudinal cuticular crest behind the subpetiolar process; the crest is low, but usually obvious. Only *dulcis* has the metafemur as deep as *belti* (MfL/MfH 4.60–5.50 in *dulcis*, 4.62–5.22 in *belti*), but as well as the narrower head and longer scapes of *dulcis* (CI 68–74, SI 145–160), the side of the head behind the eye has 4–5 projecting setae (as opposed to 0–1 in *belti*).

*M. belti* is a ground-nesting species of montane rainforest, where it has been recorded as nesting in moss. Workers have also been retrieved from leaf litter, from beating low vegetation, and from a Malaise trap, which indicates that although this species is basically a ground nester and forager, *belti* also ascends vegetation.

**Material examined. Madagascar:** Prov. Toamasina, P.N. d'Andasibe-Mantadia, Forêt de Mantadia (*Blaimer & Raharimalala*); Prov. Toamasina, PN Mantadia (*Blaimer & Raharimalala*); Prov. Toamasina, PN Andasibe



(*Fisher et al.*); Prov. Toliara, P.N. Andohahela, ESE Mahamavo (*Fisher et al.*); Prov. Toliara, NW Anakara, Rés. Andohahela (*Fisher et al.*); Prov. Fianarantsoa, P.N. Ranomafana (*E.R. Harin'Hala*); Prov. Fianarantsoa, Ranomafana Nat. Park, Ambatolahy (*E. Rajeriarison*); Prov. Fianarantsoa, PN Befotaka-Midongy (*Fisher et al.*).



FIGURES 13–15. Lateral, full face and dorsal view of body. *Malagidris belti* worker CASENT0127740.

***Malagidris dulcis* Bolton & Fisher sp. n.**

(Figs 16–18, Map 128)

WORKER (holotype in parentheses). TL 4.7–5.4 (5.3), HL 1.04–1.28 (1.20), HW 0.75–0.90 (0.82), CI 68–74 (68), SL 1.12–1.38 (1.28), SI 147–160 (156), PW 0.62–0.75 (0.66), WL 1.40–1.70 (1.58) (10 measured).

Mandible with 10–12 teeth and denticles in total, finely longitudinally costulate. Scape relatively short (SI 145–160), with minute pubescence but lacking standing setae. Club segments of funiculus long and slender, distinctly longer than broad. EL 0.20–0.25 (EL/HW 0.26–0.30). With head in profile the dorsal outline above and behind the eye is more or less flat, or at most only extremely shallowly concave. With head in full-face view sides behind the eyes elongate, shallowly convex and weakly convergent posteriorly; posterior margin very shallowly concave, with a sharp occipital carina that is not raised into a translucent cuticular flange. Dorsum of head predominantly longitudinally rugulose, anastomoses absent or very sparse; posteriorly the rugulae decrease in strength. Spaces between the rugae finely reticulate-punctulate everywhere. Ventral surface of head with very weak, oblique transverse sculpture. Dorsum of mesosoma rugulose to reticulate-rugulose; spaces between the rugulae with weak punctulate ground-sculpture. Propodeal spines in profile variable in length (0.18–0.26) and degree of elevation. In the majority of specimens the spines short, stout and upcurved, with their ventral margins shallowly convex and dorsal margins shallowly concave; in others the spines are more or less straight. Propodeal declivity unsculptured. Side of mesosoma usually with scattered rugulae, but in some these are very reduced; superficial punctulae are present between the rugulae. Metafemur relatively short, MfL 1.28–1.58 (MfL/HW 1.70–1.83), relatively deep in posterior view, MfL/MfH 4.60–5.10. Peduncle of petiole slender, more or less straight to extremely feebly downcurved in profile and with a small, dentiform anteroventral process. Subpetiolar process not followed by a cuticular crest along the mid-ventral surface of the peduncle. Petiole node in profile quite broad, bluntly rounded dorsally, not acute apically. Petiole node with very weak superficial punctulate sculpture, almost effaced in some. Postpetiole in profile shallowly convex dorsally, about 1.19–1.26 times longer than high; in dorsal view distinctly longer than broad; maximum dorsal width of postpetiole *ca* 0.34–0.43, about equal to its height. Dorsum of postpetiole node finely punctulate. Base of first gastral tergite usually with basigastral costulae effaced, but sometimes vestiges are visible; tergite otherwise unsculptured. Full adult colour yellow to yellow-brown.

Pilosity: with head in full-face view the side in front of the eye with 1–2 projecting setae, the side behind the eye with 4–5 projecting setae, and also with 1–2 setae that project outward from below the eye itself; with head in profile the dorsum behind the highest point with 4–5 pairs of setae that are inclined anteriorly, followed by a transverse row of 4–6 setae closest to the posterior margin; pronotal dorsum with a transverse row of 4 setae anteriorly and 1–2 pairs close to the mesonotal margin; mesonotum with 4 pairs, the posteriormost of which is at the metanotal groove; propodeal dorsum with 1 pair, uncommonly with a second pair also present; ventral surface of metafemur with 1–2 setae, located close to the metatrochanter; petiole node with a pair of setae on its dorsum, another on its posterior face, and another posterobasally; postpetiole with 4–6 setae dorsally and with a row of 4–6 posteriorly; gaster with numerous simple setae.

QUEEN (gyne): unknown.

PUTATIVE MALE. Mandible with 6–7 sharp teeth. CI 80, SI 58, MfL 1.10 (1 measured). First funicular segment of antenna 0.55 × the length of the second segment. EL/HW 0.50. With head in profile the dorsal outline behind the posterior ocelli descends vertically to the occipital carina, without a posteriorly projecting prominence or lobe behind the vertical surface. With mesosoma in dorsal view the arc of the pronotum is concealed medially by the anterior bulge of the mesoscutum. Notauli with anterior portions discernible, but shallow and almost effaced. Peduncle of petiole with spiracles not borne on tubercles, in dorsal view the maximum width of the petiole is across the node. Postpetiole in dorsal view 1.39 × longer than broad.

Based on a single male (CASENT0135071), Madagascar: Toamasina, P.N. Andrasibe, BLF 19394 (*Fisher et al.*) (CASC). Tentatively associated with the workers of *dulcis* as the structure of head and mesosoma in the male is very similar to the male of *belti*, the species whose workers most closely resemble those of *dulcis*.

Holotype worker, **Madagascar**: Antsiranana, Ampombofofo, 25 m., 12.09949°S, 49.33874°E, 21–22.xi.2007, littoral forest, BLF 18541(8), CASENT0141811 (*Fisher et al.*) (CASC).

Paratypes. 6 workers with same data as holotype, but coded: BLF 18541 (1), CASENT0141806; BLF 18541 (2), CASENT0141807; BLF 18541 (4), CASENT0141808; BLF 18541 (6), CASENT0141809; BLF 18541 (7), CASENT0141810; BLF 18541 (9), CASENT0141812 (CASC, BMNH).

Apart from *M. belti*, which has a much broader head, shorter scape, and shorter metafemur (CI > 80, SI < 130, MfL/HW < 1.50), the worker of *dulcis* is the most setose species of the genus. Its possession of the cephalic setal array



described above, combined with 4 mesonotal pairs, including one at the metanotal groove, and at least one pair on the propodeum, render it immediately recognisable. In addition, it is the only species to have the metafemur relatively deep (MfL/MfH 4.60–5.10), a ratio matched only by *belti* (MfL/MfH 4.62–5.22), and far below those seen in the more attenuated species of the genus, where the collective MfL/MfH is 5.77 to > 12.00.



FIGURES 16–18. Lateral, full face and dorsal view of body. *Malagidris dulcis* holotype worker CASENT0141811.

There is a possibility that *dulcis*, as presently constituted, includes more than one cryptic species. Of special interest is the variation seen in the degree of elevation of the propodeal spines, and also their length. In terms of elevation the spine in profile varies from about 45° to almost vertical. At present this is not being treated as

significant, but the acquisition of more material may necessitate a re-examination. Whatever the elevation of the spine, most specimens have a propodeal spine length of 0.18–0.26. However, there is a single specimen in CASC, collected by P.S. Ward and with collection data noted below, which has a propodeal spine length of 0.38, well above the usual range. This specimen also has a slightly broader head (CI 74), slightly shorter scape (SI 145), deeper metafemur (MfL/MfH 5.50) and a broader postpetiole (length/height ratio 1.05) than is usual. As only one such specimen is available, and because its other characters match the *dulcis* material, it is retained within *dulcis*, but this should be re-assessed if similar material is ever rediscovered.

*M. dulcis* occurs under stones and in leaf litter samples in rainforest. It has also been discovered in littoral forest, and once in tropical dry forest where it was foraging on the ground.

**Non-paratypic material examined. Madagascar:** Prov. Antsiranana, Forêt Andavakoera, ENE Amilobe (Fisher *et al.*); Prov. Antsiranana, Forêt d'Ampombofofo (Fisher *et al.*); Prov. Antsiranana, Res. Ankarana, SE Matsaborimanga, PSW11031, CASENT0192051 (P.S. Ward).

### ***Malagidris galokoa* Bolton & Fisher sp. n.**

(Figs 19–21, Map 129)

WORKER (holotype in parentheses). TL 4.8–5.3 (5.3), HL 1.05–1.15 (1.12), HW 0.72–0.78 (0.76), CI 67–70 (68), SL 1.20–1.30 (1.26), SI 163–170 (166), PW 0.58–0.64 (0.62), WL 1.40–1.62 (1.58) (10 measured).

Mandible with 10–12 teeth and denticles in total, finely longitudinally costulate. Scares relatively long (SI 163–170), with minute pubescence but lacking standing setae. Club segments of funiculus long and slender, distinctly longer than broad. EL 0.20–0.22 (EL/HW 0.26–0.28). With head in profile the dorsal outline above and behind the eye is shallowly concave. With head in full-face view sides behind the eyes elongate, shallowly convex and distinctly convergent posteriorly; posterior margin very shallowly concave, with a sharp occipital carina that is not raised into a translucent cuticular flange. Dorsum of head predominantly longitudinally rugulose, anastomoses absent or very sparse; posteriorly the rugulae decrease in strength. Spaces between the rugae finely reticulate-punctulate everywhere. Ventral surface of head with very weak, oblique transverse sculpture. Dorsum of pronotum shallowly reticulate-rugose; spaces between the rugae with punctulate ground-sculpture. Propodeal dorsum predominantly reticulate-punctulate and with weak rugulae also present. Propodeal spines broad basally, strongly elevated and very conspicuously recurved, so strongly recurved that in profile their apices are directed anterodorsally. Propodeal declivity unsculptured. Side of mesosoma rugulose to reticulate-rugulose. Metafemur relatively short, MfL 1.42–1.54 (MfL/HW 1.95–1.99), moderately deep in posterior view, MfL/MfH 5.77–6.45. Peduncle of petiole slender, slightly downcurved in profile and with a small, dentiform anteroventral process. Subpetiolar process not followed by a cuticular crest along the mid-ventral surface of the peduncle. Petiole node in profile broad, bluntly rounded dorsally, not acute apically. Petiole node with very weak superficial punctulate to shagreenate sculpture, almost effaced in places. Postpetiole in profile shallowly convex dorsally, about 1.25–1.39 times longer than high; in dorsal view distinctly longer than broad; maximum dorsal width of postpetiole *ca* 0.34–0.36, about equal to its height. Dorsum of postpetiole node finely reticulate-punctulate. First gastral tergite unsculptured. Full adult colour yellow to yellow-brown.

Pilosity: with head in full-face view the side in front of the eye with 0–1 projecting setae, the side behind the eye with 0–1 projecting setae, never with setae that project outward from below the eye itself; with head in profile the dorsum behind the highest point with 3–5 pairs of setae that are inclined anteriorly, followed by a transverse row of 4 setae, or a widely separated pair, closest to the posterior margin; pronotal dorsum with 1–2 pairs of setae, when present the posterior pair close to the mesonotal margin; mesonotum with 1–2 pairs; without setae at the metanotal groove; propodeal dorsum without setae; ventral surface of metafemur with 1–2 setae, in the basal half; petiole node with a pair of setae on its posterior face; postpetiole with 1 pair of setae dorsally and with a row of 4 posteriorly; gaster with numerous simple setae.

QUEEN (gyne) and MALE: unknown.

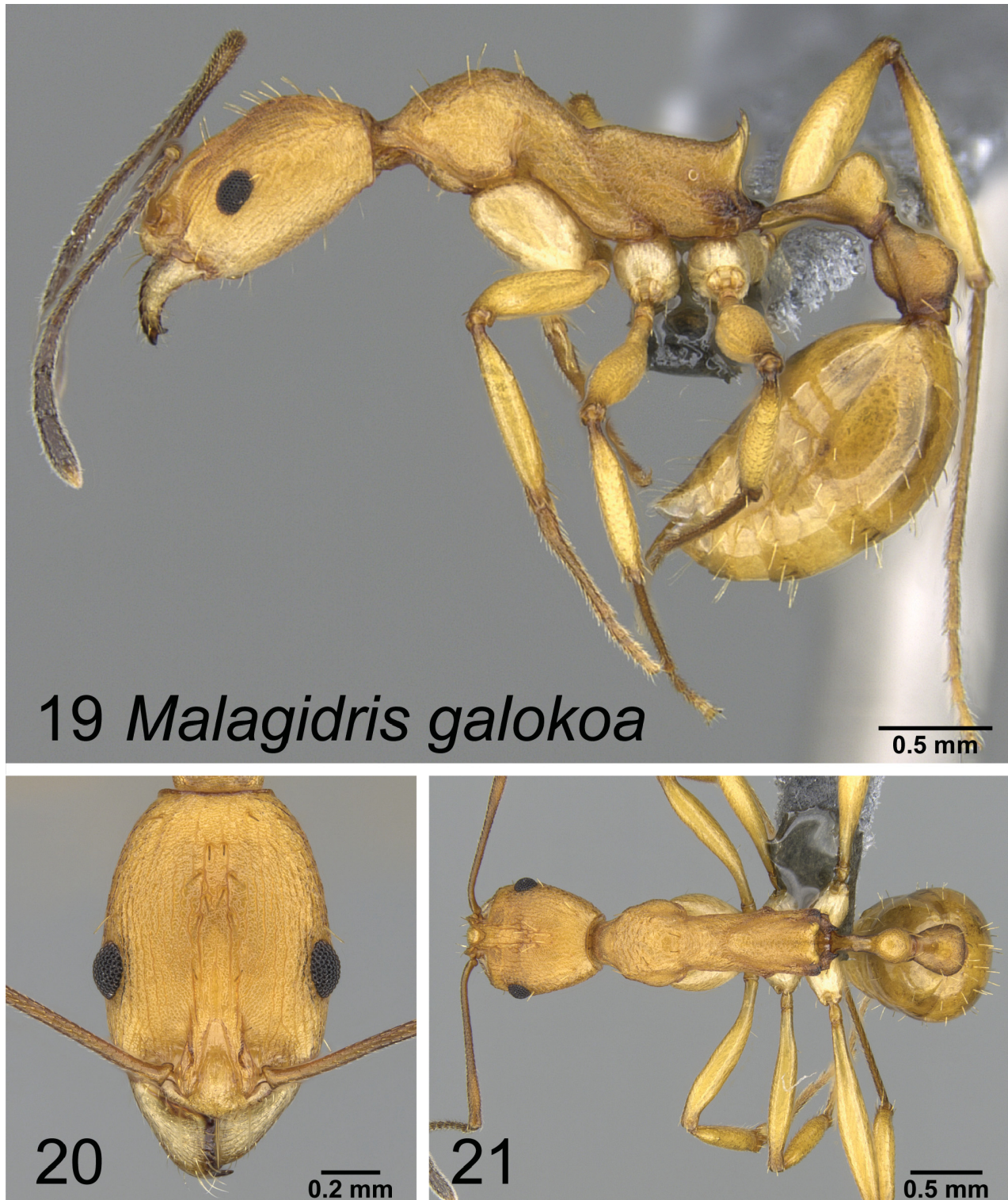
Holotype worker, **Madagascar:** Galoko chain, Mont Galoko, 980 m., -13.5888, 48.72864, 200 m., 18.ii.2013, montane forest, BLF 30793, CASENT0344994 (B.L. Fisher *et al.*) (CASC).

Paratypes. 11 workers with same data as holotype, but CASENT0301097, CASENT0344985–CASENT0344993 inclusive, CASENT0344995 (CASC, BMNH).



Workers of *galokoa* are immediately recognisable by their incredibly recurved propodeal spines, which are so recurved that their apices point anterodorsally and are reminiscent of the condition seen in the Oriental and Malesian genus *Recurvidris* (Bolton, 1992). The only other species of *Malagidris* which may exhibit upcurved propodeal spines is *dulcis*, but here, even at its most pronounced, the curvature is slight, and the apices of the spines never point anterodorsally. Confusion of the two is unlikely, but for confirmation of identity *dulcis* is an obviously more densely setose species, with 1–2 setae projecting out from below the eye, 4–5 setae projecting from the side of the head behind the eye, a pair of setae present at the metanotal groove and a pair present on the propodeal dorsum.

**Non-paratypic material examined.** Madagascar: Galoko chain, Mont Galoko (*B.L. Fisher et al.*).



FIGURES 19–21. Lateral, full face and dorsal view of body. *Malagidris galokoa* holotype worker CASENT0344994.

***Malagidris jugum* Bolton & Fisher sp. n.**

(Figs 22–24, Map 130)

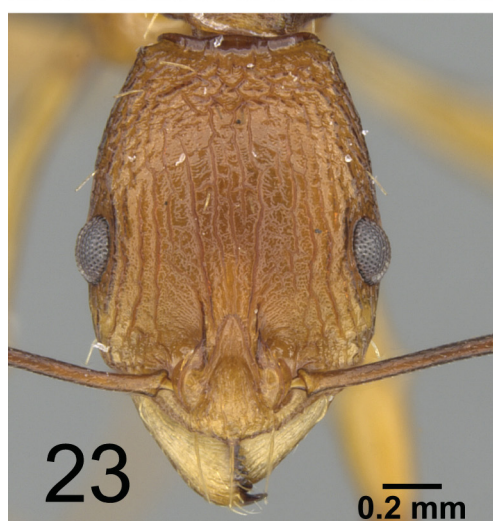
WORKER (holotype in parentheses). TL 5.5–7.7 (6.6), HL 1.30–1.56 (1.46), HW 0.86–1.12 (1.00), CI 66–73 (68), SL 1.55–1.98 (1.74), SI 164–192 (174), PW 0.73–0.98 (0.85), WL 1.86–2.28 (2.04) (20 measured).

Mandible with 10–13 teeth and denticles in total, finely longitudinally costulate. Median clypeal seta stout, in dorsal view usually arising from a small tubercle at the midpoint of a false anterior margin (tubercle may be effaced in smallest workers); below the seta there is a short, vertical or reflexed section of the clypeus that descends to the true anterior margin. In profile the clypeal setae appear to arise from a ridge that is well above the true anterior margin of the clypeus. Scapes long (SI > 160), with minute pubescence but lacking standing setae. Club segments of funiculus long and slender, distinctly longer than broad. EL 0.22–0.28 (EL/HW 0.24–0.26). With head in profile the dorsal outline above and behind the eye is more or less flat, or at most only extremely shallowly concave. With head in full-face view, sides behind the eyes elongate, shallowly convex and weakly convergent posteriorly, passing into the posterior margin through a short angle; posterior margin shallowly concave and the occipital carina raised into a translucent cuticular flange that is widest medially. Dorsum of head predominantly longitudinally rugose, with occasional anastomoses; posteriorly the rugae decreasing in strength and the number of anastomoses increasing. Spaces between the rugae finely punctulate, especially on the anterior half. Ventral surface of head with shallow, arched transverse costulae. Dorsum of mesosoma sharply rugose, the strongest rugae transverse; with some reticulation on the pronotum; spaces between the rugae mostly smooth, not reticulate-punctulate. In dorsal view the lower sides of the pronotum flared outward above the coxal articulations, so that the maximum pronotal width, across the flared portion, is 1.25–1.30 times greater than across the humeri. Propodeal spines long in profile (0.45–0.60). Propodeal declivity unsculptured, or at most with a vestige of transverse sculpture between the bases of the spines. Side of mesosoma rugose to reticulate-rugose. Metafemur long and slender, MfL 2.04–2.76 (MfL/HW 2.17–2.65, MfL/MfH 7.27–8.92). Peduncle of petiole long and slender, downcurved in profile and with a small, dentiform anteroventral process. Subpetiolar process not followed by a cuticular crest along the mid-ventral surface of the peduncle. Petiole node in profile narrowly conical, vertical to slightly inclined anteriorly; acute apically. In posterior view the sides of the petiole node approximately parallel in their lower halves, but in their upper halves convergent dorsally to a rounded apex that is usually narrowly rounded in larger, more broadly rounded in smaller, individuals. Petiole node with faint superficial punctulate sculpture, almost effaced in some. Postpetiole in profile shallowly convex dorsally, about 1.35–1.57 times longer than high; in dorsal view distinctly longer than broad; maximum dorsal width of postpetiole *ca* 0.36–0.43, about equal to its height. Dorsum of postpetiole node finely punctulate and with a few weak superficial rugulae. Base of first gastral tergite usually with short but obvious basigastral costulae, effaced in smaller workers; tergite otherwise unsculptured.

Pilosity: with head in full-face view the side in front of the eye with 0–1 projecting setae, the side behind the eye with 0–3 (usually 1) projecting setae, without setae that project outward from below the eye itself; with head in profile the dorsum behind the highest point with 3–4 pairs of setae that are inclined anteriorly, followed by a transverse row of 4–6 setae closest to the posterior margin (extremely rarely this row reduced to a single widely separated pair); pronotal dorsum with a 0–2 pairs of setae, when 2 pairs present one is at the humeri, the other is very close to the mesonotal junction, a count of 0 may be the result of abrasion; mesonotum usually with 1 pair anteriorly, but rarely a second, more posterior pair present, no setae at the metanotal groove; propodeal dorsum without setae; ventral surface of metafemur with 0–1 setae, when present close to the metatrochanter; petiole node with a pair of setae on its posterior face; postpetiole with 1–2 pairs of setae dorsally and with a transverse row of 4 posteriorly; gaster with numerous simple setae. Most of the differences in pilosity are the result of normal variation, but some may be due to abrasion. Full adult colour yellowish brown to brown.

QUEEN (gyne). Ergatoid (*e.g.* CASENT0494286). TL 6.7, HL 1.34, HW 0.99, CI 74, SL 1.40, SI 141, WL 1.92, MfL 1.86, MfL/HW 1.88, MfL/MfH 6.64. EL 0.25 (EL/HW 0.25) (1 measured). Propodeal spine length 0.44, but the spines stouter than in the worker. Postpetiole length 0.56, width 0.59, height 0.59. Most dimensions are within the worker ranges, but the scape is relatively shorter, the metafemur is both absolutely and relatively shorter, and is somewhat deeper in posterior view. In general the ergatoid matches the worker description, but the pronotal sculpture is more sharply reticulate-rugose, and the humeral angles are more pronounced. Pilosity as worker but head without the posterior transverse row (this may have been abraded away in the single specimen available). Ocelli are absent.





FIGURES 22–24. Lateral, full face and dorsal view of body. *Malagidris jugum* holotype worker CASENT0054119.

MALE. (e.g. CASENT0082288) Mandible with 9–11 sharp teeth. CI 75–76, SI 45–48, MfL 1.80–1.90 (2 measured). First funicular segment of antenna less than 0.50 times the length of the second segment. EL/HW 0.44–0.45. With head in profile the dorsal outline behind the posterior ocelli slopes down gradually to the occipital carina, the surface not vertical immediately behind the ocelli. With mesosoma in dorsal view the pronotum forms a visible anterior arc in front of the mesoscutum. Notauli absent. Peduncle of petiole with spiracles borne on tubercles, in dorsal view the tubercles large and strongly prominent, the distance across them distinctly greater than the width of the node. Postpetiole in dorsal view long and narrow,  $1.94\text{--}2.06 \times$  longer than broad.

Unassociated male. Two specimens (CASENT0085227 and CASENT0085227-D01) (one badly damaged) are present in CASC (Madagascar: Prov. Antsiranana, P.N. Montaigne d'Ambre, MA-01-01D-04 (E.R. Harin'Hala)),

that appear close to *jugum* but are specifically distinct. They contrast to the male of *jugum* as follows. Mandible with 8–9 sharp teeth. CI 84, SI 42, MfL 1.10. First funicular segment of antenna 0.40 times the length of the second segment. EL/HW 0.48. Peduncle of petiole with spiracles borne on tubercles, in dorsal view the tubercles large and strongly prominent, the width across them is greater than the width across the node. Postpetiole in dorsal view shorter and broader,  $1.25 \times$  longer than broad.

It is most likely that these two males represent a species whose worker remains undiscovered, but it is also possible that *jugum*, as presently envisaged, consists of two unrecognised siblings. A final, but much less probable, situation is that the males represent a socially parasitic form, but they show no characters attributable to the “inquiline syndrome.”

Holotype worker, **Madagascar**: Antsiranana, Rés. Analamerana, 28.4 km. 99° Anivorano Nord, 12°44.80'S, 49°29.69'E, 60 m., 5–7.xii.2004, tropical dry forest, BLF 11400 (8), CASENT0054119, (*B.L. Fisher*) (CASC).

Paratypes. 5 workers with same data as holotype, but coded: BLF 11400 (9), CASENT0054164; BLF 11400 (10), CASENT0054165; BLF 11400 (11), CASENT0054167; BLF 11400 (LO), CASENT0054168; BLF 11400 (25), CASENT0054121 (CASC, BMNH).

The worker of this large, slender, relatively heavily sculptured species most closely resembles *alperti* in terms of habitus, relative dimensions and mesosomal sculpture. The main differences between them include the profile shape of the clypeus, indentation of the cephalic dorsum, and aspects of the pilosity.

*M. jugum* nests in the ground and forages in the leaf litter, in rotten wood and on the surface of the ground; it has been recovered from litter samples and pitfall traps. The species also ascends low vegetation and workers have been discovered investigating Malaise traps. Most collection records are from tropical dry forest, but *jugum* also occurs in rainforest and littoral forest.

**Non-paratypic material examined. Madagascar:** Prov. Antsiranana, Forêt Ampondrabe, NNE Daraina (*Fisher et al.*); Prov. Antsiranana, Forêt Binara, SW Daraina (*Fisher et al.*); Prov. Antsiranana, Rés. Spec. Ankarana, SW Anivorano Nord, NNE Daraina (*Fisher et al.*); Prov. Antsiranana, Rés. Spec. Ankarana, SW Anivorano Nord, NNE Daraina (*J. Boutin*); Prov. Antsiranana, Rés. Spec. Ankarana, SW Anivorano Nord, NNE Daraina (*Alpert et al.*); Prov. Antsiranana, Rés. Spec. Ankarana, SSW Anivorano Nord, NNE Daraina (*Fisher et al.*); Prov. Antsiranana, Rés. Spec. Ankarana, SSW Anivorano Nord, NNE Daraina (*Alpert et al.*); Prov. Antsiranana, Res. Ankarana (*G.D. Alpert*); Prov. Antsiranana, Res. Ankarana (*Alpert et al.*); Prov. Antsiranana, Res. Ankarana, Tsingy (*Alpert et al.*); Prov. Antsiranana, Res. Ankarana, English Camp (*Alpert et al.*); Prov. Antsiranana, Rés. Ankarana, SE Matsaborimanga (*P.S. Ward*); Prov. Antsiranana, Forêt Bekaraoka, ENE Daraina (*Fisher et al.*); Prov. Antsiranana, P.N. Montagne d'Ambre (*Schlinger et al.*); Prov. Antsiranana, Forêt Anlabe, ENE Daraina (*Fisher et al.*); Prov. Antsiranana, Forêt Antsahabe, W Daraina (*Fisher et al.*); Prov. Antsiranana, Montange Français, SE Diego Suarez (*Alpert et al.*); Prov. Antsiranana, Rés. Analamerana, Anivorano Nord (*B.L. Fisher*); Prov. Antsiranana, W Sakalava Beach (*Schlinger et al.*); Prov. Fianarantsoa, Ranomafana Nat. Park (*E. Rajeriarison*).

### ***Malagidris sofina* Bolton & Fisher sp. n.**

(Figs 25–29, Map 131)

WORKER (holotype in parentheses). TL 5.5–7.8 (7.2), HL 1.27–1.66 (1.50), HW 0.74–1.00 (0.93), CI 56–62 (62), SL 1.56–2.24 (2.08), SI 201–231 (224), PW 0.63–0.85 (0.74), WL 1.76–2.40 (2.16) (16 measured).

Mandible with 10–12 teeth and denticles in total, finely longitudinally costulate. Median portion of clypeus evenly convex in profile, without a false anterior margin; median clypeal seta arises from just above midpoint of anterior margin, not from a tubercle at the midpoint of an elevated false anterior margin. Median portion of clypeus with a number of weak longitudinal rugulae which may be incomplete or broken. Scapes extremely long (SI > 200), with minute pubescence but lacking standing setae. Club segments of funiculus long and slender, much longer than broad. EL 0.19–0.28 (EL/HW 0.26–0.29), with 15–16 ommatidia in the longest row. With head in full-face view sides behind the eyes elongate and strongly convergent posteriorly (width across posterior margin < 0.60  $\times$  HW), without an angle between side and posterior margin; posterior margin transverse, the occipital carina distinct but not produced into a raised translucent cuticular flange. Dorsum of head finely longitudinally rugose, the rugae weakening and fading posteriorly; spaces between the rugae conspicuously reticulate-punctulate. Ventral



surface of head with faint, superficial transverse costulae. Dorsum of mesosoma densely reticulate-punctulate, and with minute low rugulae that are disorganised on pronotum but predominantly transverse on propodeum. In dorsal view pronotum broadest behind the humeri, but the sides behind the humeri gradually increase in width and are not abruptly flared outward. Propodeal spines long (0.54–0.64), sometimes the spine extremely broad basally, occupying all of the declivity to immediately above the propodeal lobe. Propodeal declivity unsculptured. Side of mesosoma reticulate-punctulate, with scattered feeble rugulae. Metafemur very long and slender, MfL 2.15–3.04 (MfL/HW 2.81–3.20, MfL/MfH 10.24–12.29). Peduncle of petiole long and slender, downcurved in profile and with a small, dentiform anteroventral process. Subpetiolar process not followed by a cuticular crest along the mid-ventral surface of the peduncle. Petiole node in profile bluntly conical, not inclined anteriorly. In posterior view the sides of the petiole node converge dorsally to a narrowly rounded apex in smaller workers; but in larger workers the sides are shallowly convex in their lower halves, narrower and straighter in their dorsal halves, and terminate in a small dorsal peak or tubercle on each side; dorsal surface of node between the peaks shallowly concave. Petiole node with faint superficial punctulate sculpture. Postpetiole in profile convex dorsally, about 1.30–1.47 times longer than high; in dorsal view distinctly longer than broad; maximum dorsal width of postpetiole (*ca* 0.35–0.50) about equal to its height. Dorsum of postpetiole node finely reticulate-punctulate and sometimes with a few vestiges of minute rugulae. Extreme base of first gastral tergite minutely punctulate, without basigastral costulae or at most with only the faintest vestiges of costulae remaining; tergite otherwise unsculptured.

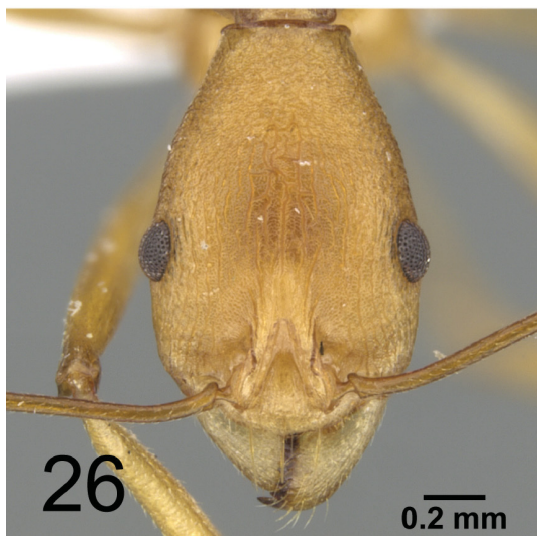
Pilosity: with head in full-face view the side, both in front of and behind the eye, without projecting setae; with head in profile the dorsum behind the highest point with 1–3 pairs of setae that are inclined anteriorly, mostly grouped around highest point of vertex, without a transverse row of setae in front of the posterior margin; pronotal dorsum usually without setae, but rarely with 1 small pair, very close to the mesonotal junction; mesonotum usually without setae but extremely rarely 1 pair present anteriorly, never with setae at the metanotal groove; propodeal dorsum lacks setae; ventral surface of metafemur lacks setae; petiole node with 0–1 pair of setae on its posterior face; postpetiole usually without setae dorsally, but rarely 1 pair present, postpetiole posteriorly with 1 pair; gaster with sparse short simple setae. Full adult colour yellow to slightly orange-yellow.

QUEEN (gyne). Ergatoid. (*e.g.* CASENT0420020) TL 7.0–7.8, HL 1.40–1.52, HW 0.97–1.00, CI 65–69, SL 1.56–1.86, SI 161–188, WL 1.94–2.08, MfL 2.08–2.40, MfL/HW 2.14–2.42, MfL/MfH 9.33–10.90 (5 measured). EL 0.26–0.28 (EL/HW 0.26–0.28). Propodeal spine length 0.47–0.56, but the spines stouter than in the worker. Postpetiole length 0.66–0.68, width 0.68–0.70, height 0.68–0.72. Most dimensions are within the worker ranges, but the head is shorter and broader, the scape is relatively shorter, and the metafemur is both absolutely and relatively slightly shorter. In general the ergatoid matches the worker description, but the mesonotum is more strongly developed and the postpetiole and gaster are distinctly more voluminous. Pilosity appears reduced from the worker condition. Of the two ergatoid paratypes one has a single pair of setae at the highest point of the vertex, the other lacks cephalic setae; both entirely lack setae from the dorsal mesosoma, petiole and postpetiole; the first gastral tergite is naked, or has setae only at the extreme posterior margin. Non-paratypic ergatoids have 0–2 pairs of setae on the cephalic dorsum, but otherwise match the paratypes. Ocelli variably developed: all three ocelli are obvious in some of the ergatoids, but in the others, including both paratype ergatoids, only a reduced median ocellus, or an ocellar pit, remains. Field dissections of ergatoid queens from Galoko revealed that ovaries were active and there was sperm in spermatheca (C. Peeters, unpublished).

MALE. (*e.g.* CASENT0906626) Mandible with 8–11 sharp teeth. CI 67–70, SI 77–80, MfL 1.96–2.16 (2 measured). First funicular segment of antenna only 0.23–0.26 × the length of the second segment. EL/HW 0.49–0.50. With head in profile the dorsal outline behind the posterior ocelli slopes down gradually to the occipital carina, the surface not vertical immediately behind the ocelli. With mesosoma in dorsal view the pronotum forms a visible anterior arc in front of the mesoscutum. Notauli absent. Peduncle of petiole with spiracles borne on low prominences, in dorsal view the width across them is distinctly less than the width across the node. Postpetiole in dorsal view 1.45–1.55 × longer than broad.

Holotype worker (upper specimen of two on pin), **Madagascar**: Prov. Antsiranana, Nosy Be, Rés. Lokobe, 6.3 km. 112° ESE Hellville, 30m., 13°25'S, 48°20'E, 19–24.iii.2001, ground nest, rainforest, BLF 3488, CASENT0427840 (*Fisher et al.*) (CASC).

Paratypes. 4 workers and 2 ergatoid queens with same data as holotype; one worker mounted below holotype, the others coded: 1 worker CASENT0427842; 2 workers CASENT0427889; 2 ergatoid queens CASENT0427841 (CASC, BMNH).



**FIGURES 25–29.** 25–27: Lateral, full face and dorsal view of body. *Malagidris sofina* holotype worker CASENT0427840. 28–29: Nest of *M. sofina* showing the ear-like turrent isolated from the surrounding clay bank. The nest was photographed on a clay bank along a mosquito-infested stream in the Forêt Ambato in the Ampasindava Peninsula on 10 December 2004.



The worker of this species has the most attenuated scapes and femora in the genus. Its SI 201–231 and MfL/HW 2.81–3.13 are greater than in any other species, where the collective measurements are SI 97–192, and MfL/HW 1.25–2.76. The metafemur is extremely long and slender (MfL/MfH > 10.0) when compared to the other species (MfL/MfH collectively < 9.0). *M. sofina* is also the most lightly sculptured member of the genus, with the predominant sculpture of the dorsal mesosoma of dense reticulate-punctulation, rather than sharp rugae. The head capsule is strongly narrowed posteriorly, and cephalic pilosity is reduced compared to the other species; there is no posterior transverse row of 4–6 setae close to the posterior margin.

*M. sofina* nests in the ground or in rotten wood, and has been found in rainforest and montane rainforest, as well as in tropical dry forest. It forages mainly on the ground and in leaf litter, but also ascends low vegetation. Nests are often associated with steep clay or stone substrate and the entrance is an ear-like turret that is sunk into a shallow alcove or raised above the rock surface (Figs 28, 29). The function of this specialized nesting behavior is not known but may be used to evade predation by other ants. The nest structure is in part similar to the clay bank nesting *Stenammina* in Central America (Longino, 2005; Branstetter, 2013).

**Non-paratypic material examined. Madagascar:** Prov. Antsiranana, Nosy Be, Rés. Lokobe: 4 series with same data as type-series but coded BLF 3478, BLF 3479, BLF 3490, BLF 3578; Prov. Antsiranana, R.S. Manongarivo, 14.5 km. 220° SW Antanambao (*B.L. Fisher*); Prov. Antsiranana, R.S. Manongarivo, 10.8 km. 229° SW Antanambao (*B.L. Fisher*); Prov. Antsiranana, R.S. Manongarivo, 12.8 km. 228° SW Antanambao (*B.L. Fisher*); Prov. Antsiranana, Ampasindava, Ambilanivy, 3.9 km. 181°S Ambaliha (*Fisher et al.*); Prov. Antsiranana, Rés. Spec. Ankarana, 13.6 km. 192° SSW Anivorano Nord (*Fisher et al.*); Prov. Antsiranana, Forêt Ambato, Ambanja (*B.L. Fisher*); Prov. Antsiranana, Nosy Be, ESE Andoany (= Hellville) (*P.S. Ward*); Galoko chain, Mont Galoko (*Fisher et al.*).

## Genus *Myrmisaraka*

(Figs 30–35, Maps 132–133)

### *Myrmisaraka* Bolton & Fisher gen. n.

Type-species: *Myrmisaraka producta* Bolton & Fisher **sp. n.**, by present designation.

#### Diagnosis of worker

Monomorphic myrmicine ants.

Mandible triangular, masticatory margin with 9–11 teeth, longer than basal margin.

Palp formula 5,3.

Stipes of maxilla with a partial transverse crest, strongest near mesial margin, petering out laterally.

Clypeus posteriorly moderately broadly inserted between the frontal lobes (width of clypeus between the lobes greater than width of one of the lobes); median portion of clypeus with 4–6 fine longitudinal rugulae, the median longitudinal strip unsculptured (no median carina present); anterior clypeal margin with a small median notch.

Clypeus usually with a pair of closely approximated short, fine setae, one on each side of the midpoint, within the median notch; rarely with only a single seta present (see comment 1, below).

Clypeus with lateral portions not raised into a shielding wall or sharp ridge in front of the antennal sockets.

Frontal carinae short, restricted to well defined but narrow frontal lobes.

Antennal scrobes absent.

Antenna with 12 segments, with a 3-segmented to weakly 5-segmented apical club.

Torulus with upper lobe visible in full-face view.

Eyes present, relatively large, located at about the midlength of the head capsule.

Head capsule without a median, longitudinal carina; occipital carina conspicuous.

Pronotal humeri weakly angulate in dorsal view.

Pronotum plus anterior mesonotum swollen and distinctly convex in profile, almost dome-like; dorsalmost point of promesonotum on a considerably higher level than propodeal dorsum.

Promesonotal suture absent; metanotal groove almost effaced.

Propodeum strongly bispinose; propodeal lobes small and rounded.

Propodeal spiracle large and conspicuous, at about the midheight and midlength of the sclerite, far in front of the margin of the declivity and separated from apex of metapleural gland bulla by about the spiracle's diameter.

Metasternal process absent; a posteriorly divergent pair of weak carinae present that arise just anterior of the metasternal pit, diverge posteriorly, and terminate at the inner margins of the metacoxal annuli.

Tibial spurs: mesotibia 1; metatibia 1; both simple.

Abdominal segment 2 (petiole) with a long, narrow anterior peduncle; spiracle at the midlength of the peduncle.

Subpetiolar process in profile a small spiniform tooth.

Abdominal segment 3 (postpetiole) dorsoventrally flattened in profile, the sternite convex; tergite very broad in dorsal view.

Stridulitrum present on pretergite of abdominal segment 4.

Abdominal tergite 4 (first gastral) does not overlap the sternite on the ventral surface of the gaster; gastral shoulders absent.

Sting strongly developed, simple.

Main pilosity of dorsal head and body: simple and fine, present on propodeal dorsum.

### Diagnosis of queen (gyne)

Ergatoid in *producta*, unknown in *brevis*. The ergatoid lacks ocelli and mostly matches the worker description. The mesonotum is enlarged by comparison with the worker, and its margins are more strongly defined. The promesonotal suture forms a broad, shallow impression and the posterior mesonotum is defined in profile. Propodeal spiracle separated from apex of metapleural gland bulla by less than the spiracle's diameter. Peduncle of petiole shorter and stouter than in worker. Postpetiole and gaster in dorsal view broader than in worker, as discussed under *producta* queen.

### Diagnosis of male

Known only for *M. producta*. Slightly smaller than workers. Mandible triangular and strongly dentate, with 9–10 teeth. Palp formula 5,3 (*in situ* count). Clypeus with an anterior apron. Antenna with 12 segments, long and filiform. SI 37–44. First funicular segment short, not globular, about one third the length of the second funicular segment. In full-face view eye either located behind midlength of head capsule, or occupying most of the side. Ocelli conspicuous. Mesotibia and metatibia each with a single simple spur. Notauli very reduced or absent, at most the anterior arms discernible as extremely feeble impressions. Mesopleuron with a marked transverse sulcus. Propodeum armed with a pair of small, triangular teeth, the spiracle at about the midlength of the sclerite; propodeal lobes rounded. Petiole with an anterior peduncle, the spiracle at about the midlength of the peduncle, well in front of the level of the node. Subpetiolar process present, small. Parameres large. Cerci present. Pilosity slender, fine and dense everywhere.

Forewing venation.  $Rs \cdot f4-5$  does not meet  $R \cdot f3$  on anterior margin of wing (= marginal cell open).  $2rs-m$  absent.  $1m-cu$  present. Fusion of  $Rs+M$  extended distally, so that  $1m-cu$  arises from  $Rs+M$ , not from  $M$ .  $Rs \cdot f3$  present ( $Rs+M$  divides into  $Rs \cdot f3$  and  $M \cdot f3-4$  proximal of the junction with  $2r-rs$ ).  $A \cdot f2$  long, not merely a stub distal of  $cu-a$ , the latter is retracted toward the wing base and arises from  $M+Cu$ , proximal of the point where it divides into  $M \cdot f1$  and  $Cu \cdot f1-2$ .

Males taken in association with workers are unknown. However, there is one male-based species (2 specimens) from Prov. Toamasina, Betampona Reserve, BLF 19594-49, CASENT0143821, and BLF 19594-55, CASENT0145230 that are linked by DNA structure to *Myrmisaraka producta* (B.L. Fisher, unpublished). A second male-based species (1 specimen), Prov. Toamasina, Ambodiriana, BLF 12838, CASENT0068183 is congeneric with the male of *producta* but apparently not linked to *brevis*, the other worker-based species included here.

The two different male forms are easily distinguished as one has much larger eyes than the other. *M. producta*: eyes larger, in full-face view the maximum length of the eye is  $0.64 \times HL$ ; in profile the shortest distance from the dorsal margin of the eye to the base of the posterior ocellus is less than the vertical height of the ocellus. Second male form (Ambodiriana): eyes smaller, in full-face view the maximum length of the eye is  $0.47 \times HL$ ; in profile the shortest distance from the dorsal margin of the eye to the base of the posterior ocellus is greater than the vertical height of the ocellus.

### Comments on *Myrmisaraka*

1 In the vast majority of *Myrmisaraka* workers there are two setae within the notch on the anterior clypeal margin. They are short and fine, located close together, one on each side of the midpoint of the margin. Much more rarely, there is only a single seta present. In some instances the seta is off-centre and obviously indicates that its twin has fallen off and been lost. However, in a very few specimens there is a single seta that is definitely median.



The occurrence of this variation within a species is uncommon in myrmicines, having been recorded elsewhere only in a few species of *Stenamma* and *Rogeria* (Bolton, 2003; Branstetter, 2009).

2 This small genus resembles the very widespread *Aphaenogaster* in habitus. The following characters distinguish the two.

In *Myrmisaraka* a transverse crest is present on at least the mesial half of the stipes; a distinct subpetiolar process is present that appears as a sharp tooth in profile but as a transverse crest in ventral view; the propodeal spiracle is large and relatively low on the side, closer to the apex of the metapleural gland than to the dorsal outline; the postpetiole is elongate, dorsoventrally flattened in profile and very broad in dorsal view; the sting is strongly developed and conspicuous. In addition, the pair of setae that straddle the midpoint of the anterior clypeal margin are short, very fine, and are closely approximated basally. Finally, the ventral metathorax has a posteriorly divergent pair of carinae, that arise just anterior of the metasternal pit, diverge posteriorly, and terminate at the inner margins of the metacoxal annuli.

The corresponding states in *Aphaenogaster* are: a transverse crest is usually absent from the stipes (weakly visible in a few species, strong only in *A. relictus* Wheeler & Mann, from Haiti, which may not be properly referable to this genus); subpetiolar process is absent; propodeal spiracle is small and relatively high on the side, usually closer to the dorsal outline than to the apex of the metapleural gland; postpetiole is not elongate nor dorsoventrally flattened in profile (usually strongly convex and dome-like), and is not broad in dorsal view; the sting is extremely weakly developed and usually invisible. In addition, the pair of setae that straddle the midpoint of the anterior clypeal margin are long and stout, markedly separated basally. The ventral metathorax does not show a divergent pair of carinae such as are described above. The validity of this final observation needs confirmation as the number of *Aphaenogaster* species examined is small, but does include the Madagascan *A. swammerdami* Forel.

The Malagasy fauna includes three *Aphaenogaster* species, all confined to Madagascar itself, *A. friederichsi* Forel, *A. gonacantha* (Emery) and *A. swammerdami* Forel. The second and third of these belong to the old subgenus *A. (Deromyrma)*, principally characterised by the extension of the posterior portion of the head into a long, narrow, constricted neck. Because of this striking development these two species can not be confused with *Myrmisaraka*. *A. friederichsi* does not exhibit this modification, but differs from *Myrmisaraka* in all the characters mentioned above.

## Synopsis of *Myrmisaraka* species

*brevis* Bolton & Fisher sp. n.

*producta* Bolton & Fisher sp. n.

## Key to *Myrmisaraka* species (workers)

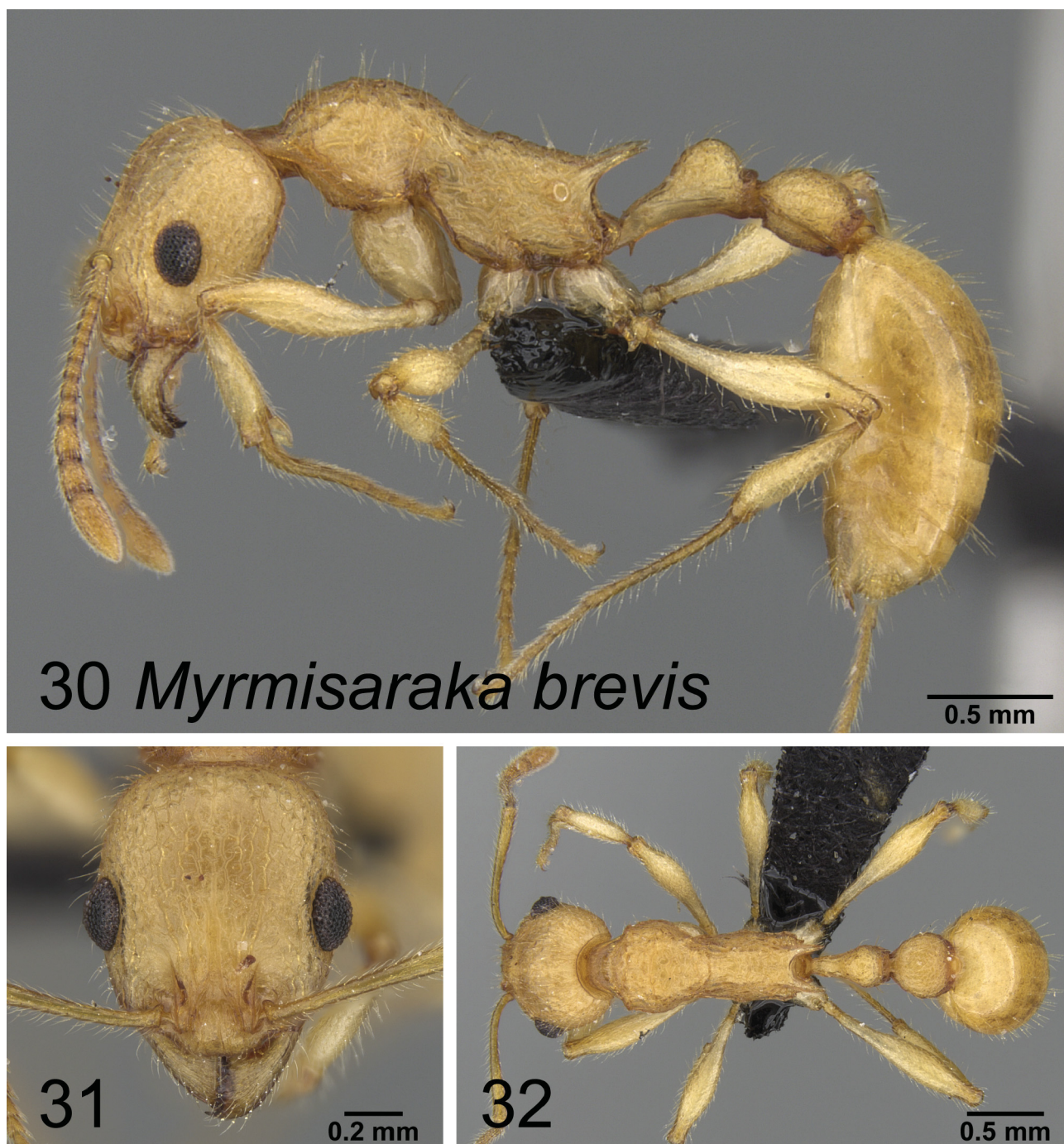
- 1 Antenna terminates in a distinct club of three segments (Fig. 30). Funiculus segment 8 relatively short,  $1.00\text{--}1.25 \times$  longer than broad; funiculus segment 9 relatively long,  $1.70\text{--}2.00 \times$  longer than funiculus segment 8. Antennal scape relatively shorter, SI 99–111. In profile, anterior face of petiole node more shallowly inclined with respect to the peduncle (Fig. 30). . . . . *brevis*
- Antenna terminates in a club of four or five segments (Fig. 33). Funiculus segment 8 relatively long,  $1.55\text{--}1.75 \times$  longer than broad; funiculus segment 9 relatively short,  $1.00\text{--}1.20 \times$  longer than funiculus segment 8. Antennal scape relatively longer, SI 115–129. In profile, anterior face of petiole node more steeply inclined with respect to the peduncle (Fig. 33). . . . . *producta*

## Species of *Myrmisaraka*

*Myrmisaraka brevis* Bolton & Fisher sp. n.

(Figs 30–32, Map 132)

WORKER (holotype in parentheses). TL 4.6–5.1 (5.0), HL 1.00–1.10 (1.02), HW 0.79–0.92 (0.83), CI 79–85 (81), SL 0.80–0.96 (0.88), SI 99–111 (106), PW 0.58–0.68 (0.62), WL 1.30–1.42 (1.34), MfL 1.02–1.18 (1.10) (20 measured).



FIGURES 30–32. Lateral, full face and dorsal view of body. *Myrmisaraka brevis* holotype worker CASENT0494587.

Very similar to, and mostly matching the description of, *producta* (below), but with an obviously 3-segmented antennal club, in which funiculus segment 8 is only 1.00–1.25 times longer than broad, and funiculus segment 9 is relatively elongated, 1.70–2.00 × longer than funiculus segment 8. The antennal scape is relatively shorter in *brevis*, SI 99–111, than in *producta*, SI 115–129. In addition, the head capsule of *producta* averages relatively slightly narrower, CI 75–80, as opposed to CI 79–85 in *brevis*.

QUEEN (gyne) and MALE: unknown.

Holotype worker (top specimen of three on pin), **Madagascar**: Prov. Antsiranana, P.N. Marojejy, 27.6 km. 35° NE Andapa, 775 m., 14°26.1'S, 49°45.6'E, 15–18.xi.2003, ex dead twig above ground, rainforest, BLF 9049, CASENT0494587 (*Fisher et al.*) (CASC).

Paratypes. 2 workers on same pin as holotype; 3 workers with same data as holotype but CASENT0494588; 3 workers with same data as holotype but CASENT0494589 (CASC).



This species appears to nest in dead twigs on the surface of the ground in rainforest. It has also been retrieved from leaf litter samples and has been discovered foraging on low vegetation.

**Non-paratypic material examined. Madagascar:** four series with exactly the same locality data as type-series, but collections BLF 8872, 9031, 9044, 9047.

***Myrmisaraka producta* Bolton & Fisher sp. n.**

(Figs 33–35, Map 133)

WORKER (holotype in parentheses). TL 4.5–5.3 (4.9), HL 0.94–1.09 (1.00), HW 0.73–0.85 (0.77), CI 75–80 (77), SL 0.89–1.10 (0.94), SI 115–129 (122), PW 0.56–0.66 (0.58), WL 1.25–1.42 (1.34), MfL 1.04–1.30 (1.14) (20 measured).

Mandibles finely longitudinally costulate. Pair of setae that straddle midpoint of anterior clypeal margin short and fine, closely approximated, arising within the small concave median notch in the anterior clypeal margin; infrequently only a single seta present. Median portion of clypeus with a series of 4–6 longitudinal rugulae, the median obsolete or obliterated. Eyes large and strongly convex, dome-like, very obviously interrupting the outline of the side in full-face view, EL 0.24–0.30 (EL/HW 0.31–0.35). With head in full-face view the sides shallowly convex, converging posteriorly behind the eyes, the posterior corners broadly rounded and the posterior margin shallowly convex. Occipital carina strongly developed and extends for a short distance onto ventral surface of head, then rapidly peters out just in front of the posteroventral angle. Scapes long (SI 115 or more) with elevated pubescence and a number of short, fine curved setae that are suberect to subdecumbent and inclined toward the scape apex. Antenna with a 4- or 5- segmented club. The 4-segmented club is achieved by the elongation of funiculus segment 8, so that it is 1.55–1.75  $\times$  longer than broad. This elongation of funiculus segment 8 brings its length closer to that of segment 9, so that funiculus segment 9 is only 1.00–1.20  $\times$  longer than segment 8. In some workers (and in the ergatoid) funiculus segment 7 is also somewhat elongated, so that the club appears weakly 5-segmented. Sides and dorsum of head with numerous fine setae. Head predominantly irregularly longitudinally rugulose, with some cross-meshes, especially posteriorly; spaces between rugulae with feeble ground sculpture of superficial punctulae. Pronotum without an anterior transverse carina; promesonotal dorsum irregularly rugose and the sculpture more strongly expressed than on the head; propodeal dorsum irregularly rugose. In profile, sides of pronotum, metanotum and propodeum reticulate-rugulose, but on mesopleuron the rugulae somewhat stronger and predominantly longitudinal. Propodeal spines long (*ca* 0.35–0.36), slender and acute, distinctly longer than their basal width in profile; in dorsal view weakly divergent posteriorly. Legs relatively long and slender, MfL > 1.00. All femora and tibiae with outstanding fine setae on all surfaces. Subpetiolar process appears as a small tooth in profile, but in posterior view is seen as a transverse ridge. Peduncle of petiole in profile longer than the node, the latter evenly rounded dorsally. In dorsal view the postpetiole slightly broader than long and broader than the petiole node; postpetiole sides convex and divergent for more than three-quarters of their length, then convergent posteriorly. Sternite of postpetiole distinctly broader posteriorly than anteriorly. Sides and dorsum of petiole and postpetiole very weakly rugulose, but the sculpture almost effaced on the posterior surface of the petiole. First gastral tegite unsculptured. Dorsal surfaces of mesosoma, petiole, postpetiole and first gastral tergite with numerous fine, simple setae; those on the propodeal dorsum confined to the posterior half of its length. Full adult colour uniform yellow to light brown.

QUEEN (gyne). Ergatoid (CASENT0495050, BLF 8146, data below (CASC)). TL 5.2, HL 1.01, HW 0.81, CI 80, SL 0.98, SI 121, PW 0.61, WL 1.34, MfL 1.22 (1 measured). Eyes slightly larger than in worker, EL 0.30 (EL/HW 0.36); ocelli absent. Anterior clypeal margin medially has only a single seta, but this is off-centre and implies that one seta (the left) has been lost from an original pair. As in some workers funiculus segment 7 is lengthened, so that the club is weakly 5-segmented. Mesonotum enlarged and its margins more strongly defined. Promesonotal suture a broad, shallow impression and the posterior mesonotum defined in profile. Postpetiole and gaster in dorsal view distinctly broader than in worker. Maximum width of postpetiole in dorsal view 0.44–0.52 in worker, 0.65 in ergatoid; of gaster in dorsal view 0.78–0.93 in worker, 1.34 in ergatoid.

A single specimen out of 9 in series BLF 13148 (data below) also appears to represent an ergatoid, but it is not nearly so conspicuous as the one just discussed. Its mesosoma and waist segments are more like the ergatoid form than that of the workers, and the width of its postpetiole (0.54) and gaster (1.10), while much broader than in

workers of the same series (0.44–0.50 and 0.85–0.93, respectively), are less than those of ergatoid BLF 8146 (0.65 and 1.34, respectively). Strangely, the head, scape and metafemur of this probable ergatoid are shorter than in the measured workers from the same series, with HL 0.99 (HL 1.02–1.09 in workers), HW 0.80 (HW 0.82–0.85 in workers), SL 0.91, SI 114 (SL 1.04–1.10 and SI 126–129 in workers), MfL 1.12 (MfL 1.26–1.30 in workers). It therefore seems that a range of morphological variation, between obvious worker and obvious ergatoid, is probable.



FIGURES 33–35. Lateral, full face and dorsal view of body. *Myrmisaraka producta* holotype worker CAsENT0344920.

MALE: see genus definition of male, above.

Holotype worker, **Madagascar**: Prov. Toamasina, Ile St. Marie, 22.8 km. 44° Ambodifotatra, 20 m., 16.82433, 49.96417, 22.xi.2005, littoral rainforest, BLF 12906, CAsENT0344920 (*B.L. Fisher et al.*) (CASC).



Paratypes. 8 workers with same data as holotype but CASENT0344921 to CASENT0344928, inclusive (CASC, BMNH).

The two species known in this genus are obviously closely related and very similar. The characters that separate them involve a number of measureable features, and are discussed under *brevis*, above. It is interesting to note that even in the few samples currently available, a simple plot of HW against SI indicates that in *producta* SI increases with increased HW, while in *brevis* SI decreases with increased HW.

*M. producta* has mostly been retrieved from rotten logs and leaf litter samples in rainforest, but it also ascends low vegetation while foraging.

**Non-paratype material examined. Madagascar:** Prov. Toamasina, Res. Betampona, 34.1 km. Toamasina, BLF 13148 (*B.L. Fisher et al.*); Prov. Toamasina, RNI Betampona (*Fisher et al.*); Prov. Toamasina, Ambohidena (*Fisher et al.*); Prov. Toamasina, Kalalao (*Fisher et al.*); Prov. Toamasina, R.S. Ambatovaky (*B.L. Fisher et al.*); Prov. Toamasina, Mont. Anjanaharibe, NNE Ambinanitelo, BLF 8146 (*Fisher et al.*); putative males: Prov. Toamasina, Rés. Nat. Betampona, 34.08 km. Toamasina BLF 19594 (*B.L. Fisher*); Prov. Toamasina, Ambodiriana BLF 12838 (*Fisher et al.*).

## Genus *Royidris*

(Figs 36–80, Maps 134–148)

### *Royidris* Bolton & Fisher gen. n.

Type-species: *Monomorium robertsoni* Heterick, 2006: 93, by present designation.

#### Diagnosis of worker

Monomorphic myrmicine ants.

Mandible triangular, masticatory margin with 5 teeth, only slightly longer than basal margin.

Palp formula 5,3.

Stipes of maxilla with a vestigial transverse crest or without a crest.

Clypeus posteriorly moderately broadly inserted between the frontal lobes (width of clypeus between the lobes greater than width of one of the lobes); median portion of clypeus with a fine, weak, longitudinal rugulae on each side, the median longitudinal strip unsculptured.

Clypeus with a stout unpaired seta at the midpoint of the anterior margin.

Clypeus with lateral portions not raised into a shielding wall or sharp ridge in front of the antennal sockets.

Frontal carinae short, restricted to well defined but narrow frontal lobes.

Antennal scrobes absent.

Antenna with 12 segments, with an apical club of 3 or 4 segments.

Torulus with upper lobe visible in full-face view.

Eyes present, relatively large, located at about the midlength of the head capsule, or slightly in front of the midlength.

Head capsule without a median longitudinal carina; occipital carina terminates in a distinct ventral prominence in posterodorsal view.

Pronotal humeri rounded in dorsal view.

Pronotum plus anterior mesonotum often swollen and distinctly convex in profile, so that the dorsalmost point of promesonotum is on a considerably higher level than propodeal dorsum (not in *admixa* group).

Promesonotal suture absent.

Propodeum unarmed, dorsum and declivity separated by a blunt angle; propodeal lobes small and rounded.

Propodeal spiracle at about the midlength of the sclerite and close to the dorsal margin, far in front of the margin of the declivity and separated from apex of metapleural gland bulla by more than the spiracle's diameter.

Metasternal process absent.

Femora usually incrassate: strongly swollen medially, distinctly tapered proximally and distally.

Tibial spurs: mesotibia 1; metatibia 1; spurs simple.

Abdominal segment 2 (petiole) with an anterior peduncle; spiracle slightly behind the midlength of the peduncle.

Subpetiolar process a minute crest.

Abdominal segment 3 (postpetiole) not dorsoventrally flattened in profile, about as high as broad.

Stridulitrum present on pretergite of abdominal segment 4.

Abdominal tergite 4 (first gastral) does not overlap the sternite on the ventral surface of the gaster; gastral shoulders absent to weakly present.

Sting present, usually weakly developed.

Main pilosity of dorsal head and body: simple, usually absent from propodeal dorsum.

### Diagnosis of queen (gyne)

Known for *admixa*, *diminuta*, *notorthotenes*, *peregrina*, and *shuckardi*, plus two unassociated forms. Alate when virgin, considerably larger than the worker. Characters as worker except for those of the mesosoma; with ocelli developed and a full complement of flight sclerites present. Pronotum in profile is slightly overhung by the convex anterior margin of the mesoscutum; in dorsal view the pronotum is not visible anterior to the mesoscutum, but projects beyond the mesoscutum anterolaterally. Propodeum in profile rounded or with an extremely obtuse angle in *diminuta* and *notorthotenes*, in all others with a pair of short, stout, broad-based triangular teeth or prominent angles. Venation: see under male.

### Diagnosis of male

Known only for *notorthotenes* and *peregrina*. About the same size as the worker or slightly smaller, much smaller than the queen. Mandible reduced, short and narrow, with only 2–3 teeth. Palp formula 5,3. Stipital crest absent. Antenna 13-segmented, filiform. SI 30–35. First funicular segment subglobular, about as broad as long and about  $0.50\text{--}0.60 \times$  the length of the second funicular segment. Eyes large, at or in front of the midlength of the sides. Ocelli large, on a low turret in *notorthotenes*; in full-face view the posterior ocelli at the posterior margin of the head. Sides of head behind eyes converge strongly to the posterior ocelli. Mesoscutum in profile strongly overhangs the pronotum, the latter not visible in dorsal view. Notauli feeble or with well developed anterior arms that form a V-shape. Mesopleuron with transverse sulcus present. Mesotibia and metatibia each with a single small, simple spur. Propodeum unarmed and rounded; propodeal lobes rounded. Subpetiolar process minute to vestigial. Cerci present.

Forewing venation.  $Rs \cdot f4\text{--}5$  does not meet  $R \cdot f3$  on anterior margin of wing (= marginal cell open).  $2rs\text{--}m$  absent.  $1m\text{--}cu$  absent ( $Rs+M$  extends without any intersecting cross-vein, from the junction of  $Rs \cdot f1$  and  $M \cdot f1$  proximally, to the division of  $Rs+M$  into  $Rs \cdot f3$  and  $M \cdot f3\text{--}4$  distally; this division is proximal of the junction with  $2r\text{--}rs$ ). In one *notorthotenes* queen a stub of  $1m\text{--}cu$  is present on the left wing, but not on the right; in another queen a stub occurs on the right wing but not on the left; entirely absent in all other alate material.  $A \cdot f2$  not merely a stub distal of  $cu\text{--}a$ , the latter retracted toward the wing base and arises from  $M+Cu$ , proximal of the point where  $M+Cu$  divides into  $M \cdot f1$  and  $Cu \cdot f1\text{--}2$ .

### Comments on *Royidris*

The 15 endemic Madagascan species included in this genus exhibit a habitus that is convergent on some groups of *Monomorium*. In his study of the Afrotropical members of that genus Bolton (1987: 290) noted two indeterminate Madagascan species which had a high palp formula (5,3), the highest attributed to *Monomorium*, but did no further analysis of these odd species because the focus of the survey was the extensive Afrotropical fauna. Heterick (2006), in his revision of the Malagasy species of *Monomorium*, recognised the peculiarity of the high palp formula and utilised it, together with some other characters, to define his *M. shuckardi* group, all members of which are now transferred to *Royidris*.

At present, no unambiguous apomorphy can be stated for *Royidris*, and in fact its habitus is similar to that commonly seen in *Monomorium*. However, a note of caution must be introduced, because no apomorphies can be cited for *Monomorium* in its currently accepted form, and it is becoming increasingly obvious that it is polyphyletic. A full survey of its present components, with more detailed morphological and molecular analyses, will be essential if the unwieldy *Monomorium* is ever to be divided into meaningful monophyletic units that can be awarded generic status. For the present, therefore, members of *Royidris* can be separated from *Monomorium* by the presence in *Royidris* of all the seven following characters in combination: palp formula 5,3; mandible with 5 teeth; antenna 12-segmented, with a club of 3 or 4 segments; propodeal spiracle in profile close to dorsal surface of



propodeum; propodeal dorsum usually without setae (one or more pairs of short setae may be present in two species); petiolar spiracle close to midlength of peduncle (not at the node); first gastral tergite does not strongly overlap the sternite on the ventral surface of the gaster.

In Madagascar, and also in Africa, only one *Monomorium* species, the tramp *M. latinode* Mayr, has 5 mandibular teeth. However, *M. latinode* has a palp formula of 3,3, unsculptured mandibles, the eye situated conspicuously far in front of the midlength of the head capsule, the propodeal dorsum transversely costulate and with numerous setae present, the petiolar spiracle at the node, and a first gastral tergite that strongly overlaps the sternite ventrally.

### Species groups of *Royidris*

Three groups of species can be isolated on worker morphological grounds within the genus. The groups are currently defined for convenience and ease of identification, and do not necessarily reflect accurate phylogeny.

1 The *admixa* group (*admixa*, *depilosa*). Antennal club of 3 segments (Figs 36, 47). Promesonotum not swollen or domed: in profile the dorsum flat or nearly so, evenly sloping posteriorly to the metanotal groove. Propodeal dorsum behind the metanotal groove approximately continues the line of the promesonotal outline; the propodeal dorsum is not considerably depressed below the level of the promesonotum (Figs 36, 45). Scapes and metafemora in the group are among the shortest in the genus (SI 90–95, MfL/HW 0.90–0.95), and the postpetiole is the broadest (maximum dorsal width  $0.42\text{--}0.48 \times \text{HW}$ ). In all other species combined, these measurements show ranges of SI 90–158 (SI < 100 only in some workers of *gravipuncta* and *clarinodis*), MfL/HW 0.95–1.50 (again, MfL/HW < 1.00 only in some workers of *gravipuncta* and *clarinodis*), maximum dorsal width of postpetiole  $0.27\text{--}0.39 \times \text{HW}$  (outside the *admixa* group  $0.39 \times \text{HW}$  is achieved only in *longiseta*).

The two species included here form a closely related pair, separated by differences in sculpture and pilosity. Both were inexplicably included as conspecific with *clarinodis* by Heterick (2006), whose description obviously included elements of several species that are recognised as separate here.

2 The *robertsoni* group (*anxietas*, *clarinodis*, *pallida*, *pulchra*, *robertsoni*). Antennal club of 3 segments (Figs 39, 42, 63, 69, 72). Promesonotum swollen or domed: in profile the dorsum convex and appearing swollen, the posterior outline of the mesonotum descends steeply, and usually abruptly, to the metanotal groove (or the junction with the propodeum in those species where the groove is suppressed). Propodeal dorsum behind the metanotal groove horizontal or sloping, decidedly not continuing the line of the promesonotal outline; the propodeal dorsum is strikingly depressed below the level of the promesonotal dorsum (Figs 39, 42, 63, 69, 72). The scape is generally shorter in this group (SI 90–110) than in the *notorthotenes* group (SI 95–158). In the *robertsoni* group the only workers with SI < 95 are some individuals of *clarinodis*, while in the *notorthotenes* group only some individuals of *gravipuncta* have SI < 100.

Together with the two species now placed in the *admixa* group, four of the five names included in this group were regarded as conspecific with *clarinodis* by Heterick (2006); only *robertsoni* was treated by him as a species separate from *clarinodis*. The group falls into two uneven complexes of species depending on whether the metanotal groove is conspicuously retained and the eyes are obviously in front of the midlength of the side of the head capsule (*clarinodis*), or the metanotal groove is suppressed and the eyes are at, or very close to, the midlength (*anxietas*, *pallida*, *pulchra*, *robertsoni*).

3 The *notorthotenes* group (*diminuta*, *etiolata*, *gravipuncta*, *longiseta*, *notorthotenes*, *peregrina*, *shuckardi*, *singularis*). Antennal club of 4 segments (Figs 51, 57, 62, 66). Promesonotum domed: in profile the dorsum convex and appearing swollen, the posterior outline of the mesonotum descends steeply, and usually abruptly, to the metanotal groove. Propodeal dorsum behind the metanotal groove horizontal or nearly so, decidedly not continuing the line of the promesonotal outline; the propodeal dorsum is strikingly depressed below the level of the promesonotal dorsum (Figs 48, 51, 54, 57, 60, 66, 78).

Both of the species that Heterick (2006) recognised, *notorthotenes* and *shuckardi*, are now considered to be compound, with *diminuta* and *etiolata* being split from his concept of *notorthotenes*, and *longiseta* and *gravipuncta* split from his concept of *shuckardi*. The two final species, *singularis* and *peregrina*, had not been discovered at the time of his study. Three complexes of species can be identified within the group. The first complex includes *longiseta*, *gravipuncta* and *peregrina*, and is characterised by denser, heavier cephalic sculpture, darker colour, relatively shorter scapes (SI 95–117), head that averages relatively broader (CI 82–89), and shorter metafemora

(MfL/HW 0.95–1.13). The second complex, which consists of *diminuta*, *etiolata* and *notorthotenes*, has cephalic sculpture that is weak to vestigial, uniform yellow in colour, relatively longer scapes (SI 115–158), head that averages relatively narrower (CI 75–84), and longer metafemora (MfL/HW 1.25–1.50). The final complex, which contains only *singularis*, exhibits a mixture of the features of the other two complexes. Its sculpture is largely suppressed (the head and dorsal pronotum are glassy smooth), its scapes are long (SI 121), and its body is darkly coloured; it has MfL/HW 1.13, at the top end of the range of the *gravipuncta* complex but well below that of *notorthotenes* and its relatives. *R. shuckardi* cannot be placed in any complex as it is known only from a single queen, but its 4-segmented antennal club indicates its placement within this species group.

## Synopsis of *Royidris* species

### *admixa* group

*admixa* Bolton & Fisher **sp. n.**

*depilosa* Bolton & Fisher **sp. n.**

### *robertsoni* group

*anxietas* Bolton & Fisher **sp. n.**

*clarinodis* (Heterick, 2006) **comb. n.**

*pallida* Bolton & Fisher **sp. n.**

*pulchra* Bolton & Fisher **sp. n.**

*robertsoni* (Heterick, 2006) **comb. n.**

### *notorthotenes* group

*diminuta* Bolton & Fisher **sp. n.**

*etiolata* Bolton & Fisher **sp. n.**

*gravipuncta* Bolton & Fisher **sp. n.**

*longiseta* Bolton & Fisher **sp. n.**

*notorthotenes* (Heterick, 2006) **comb. n.**

*peregrina* Bolton & Fisher **sp. n.**

*shuckardi* (Forel, 1895) **comb. n.**

*singularis* Bolton & Fisher **sp. n.**

## Key to *Royidris* species (workers)

(*R. shuckardi* is excluded as only its queen is known.)

- 1 Antennal club of 4 segments (Figs 51, 57, 60, 62, 66): in general, funiculus segments 8 and 9 appear very similar in length and volume. Funiculus segment 8 appears distinctly larger and more voluminous than segment 7. Segment 8 is disproportionately enlarged, out of proportion with the gradual increase in size of funiculus segments 4–7 . . . . . 2
- Antennal club of 3 segments (Figs 36, 42, 47, 63, 69, 72): in general, funiculus segment 8 appears distinctly smaller and less voluminous than segment 9. Funiculus segment 8 is only slightly larger than segment 7. Size of segment 8 is in proportion with the gradual increase in size of funiculus segments 4–7 . . . . . 8
- 2 With head in full-face view the dorsum between and behind the eyes with conspicuous sculpture present (Figs 55, 58, 67). Mid-dorsal strip of head, behind the frontal carinae, distinctly more strongly sculptured than the clypeus. Scape averaging shorter, SI 95–117 . . . . . 3
- With head in full-face view the dorsum between and behind the eyes smooth or very nearly so, at most the surface with vestigial punctulate sculpture or superficial microreticulate patterning (Figs 50, 52, 61, 79). Mid-dorsal strip of head, behind the frontal carinae, as smooth as, or only fractionally more sculptured than, the clypeus. Scape averaging longer, SI 115–158 . . . 5
- 3 With mesosoma in profile, the longest setae on the promesonotal dorsum are distinctly longer than the maximum vertical diameter of the eye at its midlength (Fig. 57). Propodeal dorsum with 2 or more pairs of short, standing setae. . . . . *longiseta*
- With mesosoma in profile, the longest setae on the promesonotal dorsum are distinctly shorter than the maximum vertical diameter of the eye at its midlength (Figs 54, 78). Propodeal dorsum without standing setae, at most a few minute, decumbent pubescence hairs present . . . . . 4
- 4 Reticulate-punctate sculpture of cephalic dorsum strong and usually of uniform density everywhere (Fig. 55). Pronotal dorsum densely reticulate-punctate, often also with weak transverse striolae; pronotal dorsum usually as strongly and densely sculp-

- tured as the propodeal dorsum (Fig. 56). First gastral tergite superficially microreticulate. Scape and metatibia relatively shorter, SI 95–107 (mean SI 101), MfL/HW 0.95–1.06 ..... *gravipuncta*
- Reticulate-punctate sculpture of cephalic dorsum fine and more diffuse, the sculpture may be partially or mostly effaced (Fig. 67). Pronotal dorsum with reticulate-punctate sculpture very weak to effaced, never with transverse striolae; pronotal dorsum not as strongly or densely sculptured as the propodeal dorsum (Fig. 68). First gastral tergite glassy smooth. Scape and metatibia relatively longer, SI 108–118 (mean SI 113), MfL/HW 1.08–1.13 ..... *peregrina*
- 5 Brown species with black gaster. Dorsum of head glassy smooth, with widely scattered minute punctures. Pronotal dorsum glassy smooth, without punctulate or microreticulate sculpture (Figs 78–80). Eyes smaller, EL/HW 0.28. Metafemur relatively shorter, MfL/HW 1.13 ..... *singularis*
- Uniformly yellow species. Dorsum of head with superficial microreticulate or reticulate-punctulate sculpture, at least in part. Dorsum of pronotum partially to mostly microreticulate to punctulate (Figs 48–53, 60–62). Eyes larger, EL/HW 0.29–0.32. Metafemur relatively longer, MfL/HW 1.25–1.50 ..... 6
- 6 Scape relatively very long, SI 148–158. Metafemur longer and somewhat less strongly incrassate, MfL/HW 1.46–1.50, MfL/MfH 4.00–4.38 ..... *etiolata*
- Scape relatively shorter, SI 115–132. Metafemur shorter and somewhat more strongly incrassate, MfL/HW 1.25–1.39, MfL/MfH 3.36–4.15 ..... 7
- 7 Larger species, HL 0.80–0.98, HW 0.65–0.81, SL 0.86–1.00, EL 0.20–0.24 ..... *notorthotenes*
- Smaller species, HL 0.66–0.73, HW 0.50–0.58, SL 0.66–0.73, EL 0.16–0.18 ..... *diminuta*
- 8 Promesonotum in profile slopes gradually and shallowly posteriorly to the metanotal groove; propodeal dorsum behind the metanotal groove approximately continues the line of the promesonotum and is not strongly depressed below the level of the promesonotal dorsum (Figs 36, 45). Postpetiole relatively broad, its maximum width in dorsal view  $0.42\text{--}0.48 \times \text{HW}$  ..... 9
- Promesonotum in profile convex, swollen or dome-like, descending steeply posteriorly to the metanotal groove (or the junction of mesonotum and propodeum in species where the metanotal groove is suppressed); propodeal dorsum is strongly depressed below the level of the promesonotal dorsum and does not continue its line (Figs 39, 42, 63, 69, 72). Postpetiole relatively narrow, its maximum width in dorsal view  $0.33\text{--}0.38 \times \text{HW}$  ..... 10
- 9 Dorsum of pronotum without a seta at the humeral angle (Fig. 45). Posterior face of petiole node without setae. First gastral tergite without setae except for a few at the extreme apical margin. With head in full-face view the dorsum smooth and polished, with scattered minute punctulae on a glossy surface (Fig. 46) ..... *depilosa*
- Dorsum of pronotum with a standing seta at the humeral angle (Fig. 36). Posterior face of petiole node with a pair of setae. First gastral tergite with scattered setae, located anterior to those at the extreme apical margin. With head in full-face view the dorsum densely microreticulate to reticulate-punctulate everywhere (Fig. 37) ..... *admixta*
- 10 Dorsum of head between and behind the eyes sculptured, the surface either finely reticulate-punctate or densely shagreenate-striolate (Figs 40, 73) ..... 11
- Dorsum of head between and behind the eyes unsculptured, the surface smooth except for minute and widely scattered pits (Figs 43, 64, 70) ..... 12
- 11 In profile the propodeal dorsum slopes downward posteriorly and is confluent with the declivity through a broad, shallow curve (Fig. 72); without a pair of short, erect setae on the curve. Dorsum of head to the level of the posterior margins of the eyes finely, densely shagreenate and with weak, superficial striolae, the whole surface with a silky appearance. Posterior to the level of the eyes the shagreenate component weaker and the striolae tend to be transverse. Pronotal dorsum shagreenate-striolate. Full adult colour of head and mesosoma yellow. Metafemur shorter and more strongly incrassate, MfL/HW 1.07–1.09, MfL/MfH 3.86–4.50 ..... *robertsoni*
- In profile the propodeal dorsum horizontal, not sloped downward posteriorly; dorsum meets the declivity through a blunt right-angle (Fig. 39); with a pair of short, erect setae on the dorsum just before the angle. Dorsum of head everywhere superficially punctulate to reticulate-punctulate, without a silky appearance. Pronotal dorsum mostly smooth, with only feeble superficial punctulae present. Full adult colour of head and mesosoma brown to dark brown. Metafemur longer and less strongly incrassate, MfL/HW 1.17–1.22, MfL/MfH 5.50–5.64 ..... *anxietas*
- 12 With mesosoma in profile the metanotal groove distinctly impressed; a V-shaped or narrowly U-shaped conspicuous impression present between base of mesonotum and propodeum (Fig. 42). Mandible smooth, with scattered small pits. With head in full-face view the eyes distinctly in front of the midlength of the side of the head capsule (Fig. 43). Eye smaller, EL/HW 0.22–0.26. Metafemur shorter and more incrassate, MfL/HW 0.93–1.04, MfL/MfH 3.67–4.00 ..... *clarinodis*
- With mesosoma in profile the metanotal groove not impressed; without a V-shaped or narrowly U-shaped impression between base of mesonotum and propodeum (Figs 63, 69). Mandible with fine longitudinal costulae. With head in full-face view the eyes very close to the midlength of the side of the head capsule (Figs 64, 70). Eye larger, EL/HW 0.28–0.32. Metafemur longer and less incrassate, MfL/HW 1.12–1.32, MfL/MfH 5.60–6.00 ..... 13
- 13 Head and mesosoma uniformly yellow, gaster paler, very pale yellow (Fig. 63). Lower half of side of pronotum without punctate sculpture such as occurs on the mesopleuron. Smaller species with relatively shorter scape, smaller eye (Fig. 64), and shorter metafemur, HW 0.50, SL 0.50, SI 100, EL/HW 0.28, MfL/HW 1.12 ..... *pallida*
- Head and mesosoma brown, gaster darker, black (Fig. 69). Lower half of side of pronotum with punctate sculpture similar to that present on mesopleuron. Larger species with relatively longer scape, larger eye (Fig. 70), and longer metafemur, HW 0.59, SL 0.66, SI 112, EL/HW 0.32, MfL/HW 1.32 ..... *pulchra*





FIGURES 36–38. Lateral, full face and dorsal view of body. *Royidris admixta* holotype worker CASENT0017121.

### Species of *Royidris*

#### *Royidris admixta* Bolton & Fisher sp. n.

(Figs 36–38, Map 134)

WORKER (holotype in parentheses). TL 1.8–2.3 (1.9), HL 0.46–0.56 (0.51), HW 0.36–0.47 (0.40), CI 78–83 (78), SL 0.34–0.44 (0.38), SI 92–95 (95), PW 0.26–0.34 (0.29), WL 0.54–0.68 (0.58) (12 measured).

Antennal club 3-segmented. Scares short (SI < 100); when laid straight back in full-face view the apex of the scape just fails to reach the posterior margin of the head. With head in full-face view the eyes in front of the

midlength of the side of the head capsule. EL 0.09–0.12 (EL/HW 0.24–0.27). Entire dorsum of head very finely reticulate-punctulate to reticulate-shagreenate. Promesonotum in profile not swollen or domed, the dorsum shallowly convex to the weakly impressed metanotal groove. Propodeal dorsum more or less flat and slopes posteriorly, the dorsal line of the propodeum approximately follows that of the promesonotum; the propodeum is not strongly depressed below the level of the promesonotum. Pronotum with a short seta at each humeral angle; sometimes a second pair is present on the pronotum behind the humeral pair. Mesonotum frequently with a single pair of short setae, but setae always absent from the propodeum. Dorsum of mesosoma finely reticulate-punctulate to reticulate-shagreenate everywhere; entire side of mesosoma finely reticulate-punctulate. Metafemur relatively short, MfL 0.34–0.44 (MfL/HW 0.90–0.97, MfL/MfH 2.85–3.36). Petiole with a single pair of setae on the posterior face of the node; postpetiole with 2–4 setae present posteriorly; first gastral tergite with setae present anterior to those at the extreme posterior margin. Postpetiole relatively broad in dorsal view, maximum width 0.16–0.20 (0.42–0.45 × HW). Colour dull yellow to yellowish brown; gaster may be somewhat darker.

QUEEN (gyne). Alate when virgin. TL 3.9–4.1, HL 0.68–0.70, HW 0.61–0.62, CI 87–90, SL 0.54, SI 87–89, PW 0.51–0.54, WL 1.14–1.18 (2 measured). EL 0.18–0.20 (EL/HW 0.30–0.32). Sculpture of dorsum of head similar to worker, but with fine longitudinal striolate sculpture behind the frontal carinae, and with very weak, fine transverse striolae behind the ocelli. Mesoscutum unsculptured, maximum length 0.60–0.61, maximum width 0.51–0.54. Mesoscutum and scutellum with numerous erect, short setae, but setae absent from propodeum. Metafemur longer than in worker and slightly less incrassate, MfL 0.59–0.62 (MfL /HW 0.96–1.00, MfL/MfH 3.93–4.23). Propodeum with a pair of short, broad, triangular teeth.

MALE: unknown.

Holotype worker, **Madagascar**: Prov. Toliara, P.N. Andohahela, 1.7 km. 61° ENE Tsimelahy, 300 m., 24°56'S, 46°39'E, 16–20.i.2002, BLF 4916 (49), CASENT0017121, sifted litter, tropical dry forest (*Fisher et al.*) (CASC).

Paratypes. 5 workers with same data as holotype but BLF 4916 (29), CASENT0016609; BLF 4916 (31), CASENT0016615; BLF 4916 (40), CASENT0017134; BLF 4916 (46), CASENT0016647; BLF 4916 (46), CASENT0016652 (CASC, BMNH).

This small species is most closely related to *depilosa* (see *admixa* group definition, above), but is easily separated from it by differences in sculpture and pilosity. In particular, *admixa* always has setae present at the pronotal humeri (absent in *depilosa*), and its head and promesonotal dorsum are entirely sculptured (mostly to entirely smooth in *depilosa*).

*R. admixa* has been retrieved from litter samples, pitfall traps, and rotten logs in spiny forest and in tropical dry forest.

**Non-paratypic material examined. Madagascar**: Prov. Toliara, P.N. Andohahela, Manantalinjo, E Hazofotsy (*Fisher et al.*); Prov. Toliara, P.N. Andohahela, ENE Tsimelahy (*Fisher et al.*); Prov. Toliara, Forêt Mahavelo, Isantoria Riv., NE Ifotaka (*Fisher et al.*); Prov. Toliara, Ezahoara Canyon, E Betioky (*B.L. Fisher*); Prov. Toliara, P.N. Kirindy Mite, SE Belo sur Mer (*Fisher et al.*); Prov. Toliara, Beza-Mahafaly, E Betioky (*B.L. Fisher*).

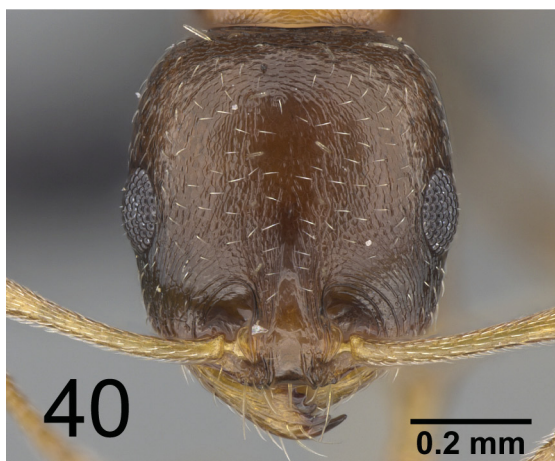
### ***Royidris anxietas* Bolton & Fisher sp. n.**

(Figs 39–41, Map 135)

WORKER (holotype in parentheses). TL 2.5–2.8 (2.7), HL 0.56–0.64 (0.63), HW 0.47–0.56 (0.56), CI 84–89 (89), SL 0.52–0.60 (0.56), SI 100–110 (100), PW 0.37–0.40 (0.39), WL 0.76–0.82 (0.80) (6 measured).

Antennal club 3-segmented. Mandible longitudinally costulate. Scapes of relatively moderate length (SI 100–110); when laid straight back in full-face view the apex of the scape slightly exceeds the posterior margin of the head. With head in full-face view the eyes very close to the midlength of the side of the head capsule. EL 0.14–0.16 (EL/HW 0.29–0.31). Dorsum of head from level of eyes to posterior margin superficially but distinctly reticulate-punctulate. This sculpture tends to fade in density and intensity dorsolaterally, where it often appears merely shagreenate. Promesonotum in profile convex and swollen, domed, the mesonotum posteriorly descends abruptly to the commencement of the propodeum; the metanotal groove is absent. In absolute profile the propodeal dorsum, from its junction with the mesonotum, is flat to extremely shallowly convex; posteriorly it meets the declivity in a blunt angle and the declivity is straight and almost vertical. The whole propodeal dorsum is strongly depressed with respect to the highest point of the promesonotum, which is on a considerably higher level. All specimens





FIGURES 39–41. Lateral, full face and dorsal view of body. *Royidris anxietas* holotype worker CASENT0205644.

appear to show some abrasion, but the maximum seta count would seem to be: pronotum with 2 (or possibly 3) pairs; mesonotum with 2 pairs; dorsum of propodeum with a single short pair, immediately above the propodeal angle (see discussion below); petiole node with 2 pairs, one apical, the other on the posterior face; postpetiole with setae dorsally and posteriorly; first gastral tergite with numerous suberect setae that are shorter than the maximum vertical diameter of the eye. Pronotal dorsum mostly smooth but with vestiges of superficial punctulate sculpture; propodeal dorsum finely reticulate-punctulate, much more strongly sculptured than the pronotum. Lower side of pronotum superficially reticulate-punctulate, this sculpture fading out on the upper half of the side. Mesopleuron and metapleuron weakly reticulate-punctulate. Metafemur relatively long and slender, MfL 0.61–0.66 (MfL/HW 1.17–1.22, MfL/MfH 5.50–5.64). Postpetiole relatively narrow in dorsal view, maximum width 0.17–0.20



(0.33–0.36 × HW). Dorsum of postpetiole with superficial fine punctulae; first gastral tergite unsculptured. Colour variable: head, mesosoma, petiole and postpetiole brown to orange-brown, or the head darker brown than the mesosoma, the gaster black (type-series); or the entire ant dark brown, with the gaster black (other material).

QUEEN and MALE: unknown.

Holotype worker, **Madagascar**: Makay Mts, 21.29961°S, 45.12919°E, 570 m., 5.xii.2010, BLF 25636, CASENT0205644, dry forest edge and burned savannah (*B.L. Fisher et al.*) (CASC).

Paratypes. 1 worker with same data as holotype but BLF 25640, CASENT0205648; 1 worker with same locality but 21.31334°S, 45.14525°E, 575 m., 6.xii.2010, BLF 25692, CASENT0206182, burned savannah (*B.L. Fisher et al.*) (CASC).

After *robertsoni*, this species has the second most densely sculptured head in the *robertsoni* group. It is easily separated from *robertsoni* by the unique shape of the propodeum in that species, its lack of propodeal setae, and its uniform light colour. *R. anxietas*, like *pallida* and *pulchra*, lacks the V-shaped, incised metanotal groove characteristic of *clarinodis*, but in *pallida* and *pulchra* the head is smooth. Within the group, *robertsoni* and *clarinodis* together have the metafemora relatively shorter and more incrassate, combined MfL/HW 0.93–1.09, and MfL/MfH 3.67–4.50. *R. anxietas*, *pallida* and *pulchra* have the metafemora relatively longer and more slender, with combined MfL/HW 1.12–1.32, and MfL/MfH 5.50–6.00.

The holotype, one paratype, and one of the three non-paratypic specimens have a conspicuous, short, erect seta on the propodeal dorsum, just anterior to the propodeal angle. The other paratype, and the other two non-paratypic specimens, lack this seta. It is assumed here that the presence of this seta is normal and that its absence represents loss by abrasion. As only six specimens are presently available this is merely a guess; the acquisition of more material is necessary to tell if the guess is accurate, or if the presence or absence of this seta is normal variation within the species. The possibility that the six specimens available may represent two species must also be considered. The three that constitute the type-series are bicoloured, with the mesosoma distinctly lighter than the gaster, while the three non-paratypic specimens are uniformly dark. By itself, colour alone would not be convincing, but the dark form also has a more weakly sculptured head. The significance of these differences cannot be assessed at present, the resolution of the problem must await future investigation when more material of both forms has accumulated. The two specimens from Ambovo Springs were included as part of *clarinodis* by Heterick (2006).

Most individuals of *anxietas* have been collected in dry forest edges and burned savannah, but samples have also been retrieved from pitfall traps in uapaca woodland, and once from an urban garden.

**Non-paratypic material examined.** **Madagascar**: Prov. Toliara, Makay Mts (*B.L. Fisher et al.*); Prov. Fianarantsoa, P.N. Isalo, Ambovo Springs, N. Ranohira (*Fisher et al.*).

### ***Royidris clarinodis* (Heterick) comb. n.**

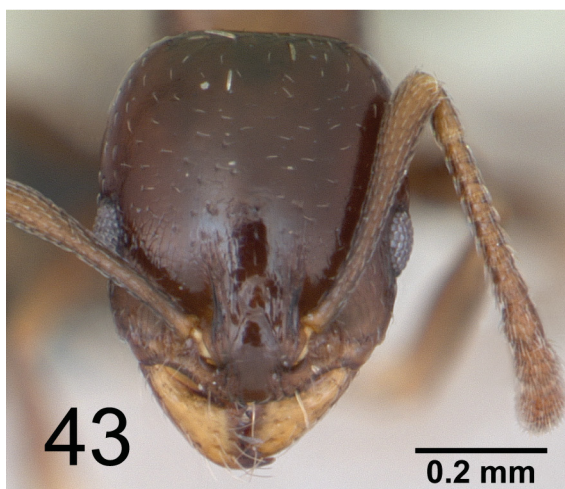
(Figs 42–44, Map 136)

*Monomorium clarinodis* Heterick, 2006: 89, figs 14, 35, 36. Holotype and paratype workers, MADAGASCAR: Prov. Toliara, 6.1 km. 182° S Marovato, 25°35'S, 45°18'E, 20 m., 14.ii.2002, BLF 5528, under stone, spiny forest thicket (holotype CASENT0453836) (*Fisher et al.*) (CASC, BMNH, ANIC, MCZC) [CASC examined]. **Comb. n.**

NOTE. Heterick (2006: 89) specifically restricted the *clarinodis* type-series to those specimens with the same data as the holotype, *i.e.* the series numbered BLF 5528 and with the locality data given above. However, in CASC there is at least one specimen, name-tagged and labelled as a paratype by Heterick, which has been partially mislabelled and wrongly included in the type-series. The upper data label on the pin of this specimen gives BLF 5528, but the lower (main) data label has BLF 5504 (Prov. Toliara, Rés. Cap Sainte Marie, 12.3 km. 262° W Marovato, 25°34.90'S, 45°10.10'E, 200 m., 11–15.ii.2002). This specimen, and any others from that locality, from series BLF 5504, are excluded from the type-series.

WORKER. TL 2.0–2.5, HL 0.48–0.60, HW 0.40–0.48, CI 79–83, SL 0.37–0.47, SI 90–100, PW 0.28–0.34, WL 0.56–0.72 (14 measured).

Antennal club 3-segmented. Mandible smooth, unsculptured except for scattered small pits; in a few workers minute striolae may occur near the extreme base, but if present these do not extend onto the apical half of the mandible. Scapes relatively short (SI 100 or less); when laid straight back in full-face view the apex of the scape



FIGURES 42–44. Lateral, full face and dorsal view of body. *Royidris clarinodis* holotype worker CAsENT0453836.

just reaches the posterior margin of the head. With head in full-face view the eyes in front of the midlength of the side of the head capsule. EL 0.09–0.12 (EL/HW 0.22–0.26). Dorsum of head from level of eyes to posterior margin smooth, with scattered minute pits; in some individuals there are also very weak vestiges (often almost entirely effaced) of superficial microreticulation. Promesonotum in profile convex and swollen, the mesonotum posteriorly descending to the distinctly impressed metanotal groove, which is V-shaped to narrowly U-shaped. Propodeal dorsum slopes posteriorly and is strongly depressed, the entire dorsum on a considerably lower level than the highest point of the promesonotum. Dorsa of pronotum and mesonotum usually each with 2 pairs of setae (sometimes with only one pair on one or the other, but this may be due to abrasion); dorsum of propodeum lacks setae. Pronotal dorsum smooth and shining, with widely scattered minute punctulae. Mesonotum as pronotum but some extremely weak vestiges of superficial microreticulation may be present. Propodeal dorsum microreticulate to reticulate-punctulate, the sculpture weak and superficial but usually stronger than on the promesonotum. Mesopleuron and metapleuron weakly reticulate-punctulate, the sculpture extending anteriorly onto the side of the



pronotum as microreticulation. Metafemur relatively short, MfL 0.38–0.48 (MfL/HW 0.93–1.04, MfL/MfH 3.67–4.00). Petiole with a pair of setae on the posterior face of the node; postpetiole with 1–2 pairs of setae posteriorly; first gastral tergite with scattered short setae. Postpetiole relatively narrow in dorsal view, maximum width 0.14–0.19 (0.35–0.38 × HW). Dorsum of postpetiole and first gastral tergite unsculptured. Colour varies from mid-brown with a dark gaster, to entirely dark brown.

QUEEN and MALE: unknown.

Within the *robertsoni* group, as defined above, *clarinodis* is immediately isolated as it is the only species to combine an unsculptured head capsule with a sharply impressed, V-shaped, metanotal groove.

In Heterick's (2006) treatment of what was then the *shuckardi* group of *Monomorium*, *clarinodis* was regarded as a single species that from its description was extremely variable. In the present analysis we conclude that this taxon is certainly compound, and actually contains six separate species from two species groups (*admixa* and *depilosa* of the *admixa* group; *anxietas*, *clarinodis*, *pallida* and *pulchra* of the *robertsoni* group); the original description of *clarinodis* includes morphological elements of almost all of them. This confusion is inexplicable as members of the *admixa* group have a strikingly different mesosomal configuration from the rest of the genus, and within the *robertsoni* group only *clarinodis* has a sharply incised metanotal groove.

*R. clarinodis* is found in spiny forest, shrubland and uapaca woodland, where it nests under stones, but it has also been collected from litter samples, as ground foragers, and from pitfall traps.

**Material examined. Madagascar:** Prov. Toliara, Rés. Cap Sainte Marie, W. Marovato (*Fisher et al.*); Prov. Toliara, S Marovato (*Fisher et al.*); Prov. Toliara, P.N. Tsimanampetsotsa, Bemanateza (*Fisher et al.*); Prov. Toliara, P.N. Tsimanampetsotsa, Bemanateza, SE Behelaka (*Fisher et al.*); Prov. Fianarantsoa, P.N. Isolo, Amovo Springs, N Ranohira (*Fisher et al.*); Prov. Fianarantsoa, Ranohira, Ampandravelo III (*A. Ravelomanana*).

### ***Royidris depilosa* Bolton & Fisher sp. n.**

(Figs 45–47, Map 137)

WORKER (holotype in parentheses). TL 1.9–2.3 (2.1), HL 0.50–0.58 (0.54), HW 0.39–0.46 (0.43), CI 77–81 (80), SL 0.36–0.42 (0.40), SI 90–95 (93), PW 0.28–0.34 (0.30), WL 0.55–0.68 (0.64) (12 measured).

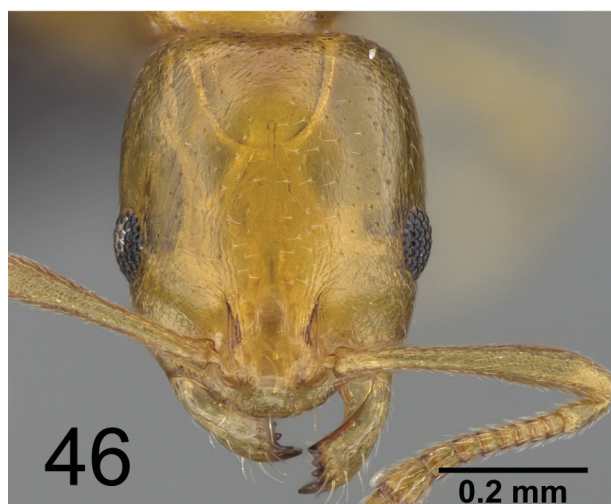
Antennal club 3-segmented. Scapes short (SI < 100), when laid straight back in full-face view the apex of the scape just fails to reach the posterior margin of the head. With head in full-face view the eyes in front of the midlength of the side of the head capsule. EL 0.09–0.12 (EL/HW 0.23–0.26). Entire dorsum of head with scattered minute pits on a smooth and polished background; here and there vestigial traces (almost entirely effaced) of superficial reticulation may be visible. Promesonotum in profile not swollen or domed, the dorsum shallowly convex to the weakly impressed metanotal groove. Propodeal dorsum more or less flat to shallowly convex and slopes posteriorly, the dorsal line of the propodeum approximately follows that of the promesonotum; the propodeum is not strongly depressed below the level of the promesonotum. Pronotum without setae at the humeral angles; entire dorsum of mesosoma lacks setae. Dorsum of promesonotum smooth and shining, with widely scattered minute punctulae. Mesonotum smooth to superficially microreticulate; propodeal dorsum more strongly sculptured but even here the sculpture weak and superficial. Side of propodeum weakly microreticulate to reticulate-punctulate; mesopleuron finely reticulate-punctulate and the sculpture usually extends onto the side of the pronotum, at least posteriorly. Metafemur relatively short, MfL 0.35–0.42 (MfL/HW 0.90–0.95, MfL/MfH 3.00–3.64). Petiole without setae on the posterior face of the node; postpetiole usually with a pair of setae present posteriorly; first gastral tergite with setae restricted to the extreme posterior margin. Postpetiole relatively broad in dorsal view, maximum width 0.17–0.21 (0.44–0.48 × HW). Colour dull yellow to yellowish brown; gaster may be somewhat darker.

QUEEN and MALE: unknown.

Holotype worker, **Madagascar:** Prov. Toliara, P.N. Tsimanampetsotsa, 6.7 km. 130° SE Efoetse, 24°06'S, 43°46'E, 25 m., 18–22.iii.2002, BLF 6160 (40), CASENT0020786, sifted litter, spiny forest/thicket (*Fisher et al.*) (CASC).

Paratypes. 7 workers with same data as holotype but BLF 6160 (10), CASENT0020489; BLF 6160 (11), CASENT0020492; BLF 6160 (25), CASENT0020528; BLF 6160 (30), CASENT0020543; BLF 6160 (31), CASENT0020545; BLF 6160 (38), CASENT0021065; BLF 6160 (45), CASENT0020772 (CASC, BMNH).





FIGURES 45–47. Lateral, full face and dorsal view of body. *Royidris depilosa* holotype worker CASENT0020786.

*R. depilosa* shares a species group with *admixa*. The two appear closely related and are principally separated from the remainder of the genus by the relatively unspecialised nature of the mesosoma in both species, as discussed under the species group diagnoses. However, *admixa* is much more densely sculptured, and more densely pilose, species than *depilosa*.

Found in litter samples and pitfall traps in tropical dry forest, spiny forest, and gallery forest.

**Non-paratypic material examined.** Madagascar: Prov. Toliara, Mahafaly Plateau, ENE Itampolo (*Fisher et al.*); Prov. Toliara, Manderano, Frontier Project (*MGF*); Forêt Beroboka, SE Ankidranoka (*Fisher et al.*); Prov. Toliara, Forêt Tsinjoriaky, E Tsifota (*Fisher et al.*).

#### ***Royidris diminuta* Bolton & Fisher sp. n.**

(Figs 48–50, Map 138)

WORKER (holotype in parentheses). TL 2.8–3.0 (3.0), HL 0.66–0.73 (0.72), HW 0.50–0.58 (0.58), CI 76–81 (81), SL 0.66–0.73 (0.70), SI 121–130 (121), PW 0.34–0.38 (0.37), WL 0.88–0.96 (0.96) (7 measured). EL 0.16–0.18 (EL/HW 0.30–0.32). MfL 0.66–0.76 (MfL/HW 1.25–1.33, MfL/MfH 3.36–3.80).





**FIGURES 48–50.** Lateral, full face and dorsal view of body. *Royidris diminuta* holotype worker CASENT0002420.

Matching the description of *notorthotenes*, and with critical indices falling within the same ranges, but *diminuta* much smaller in absolute measurements. For comparison of measurements see Table 2.

**TABLE 2.** Comparison of measurements between *Royidris diminuta* and *notorthotenes*.

	<i>diminuta</i>	<i>notorthotenes</i>
HL	0.66–0.73	0.80–0.98
HW	0.50–0.58	0.65–0.81
SL	0.66–0.73	0.86–1.00
PW	0.34–0.38	0.43–0.51
MfL	0.66–0.76	0.88–1.10

QUEEN (gyne). Alate when virgin. Very much larger than the worker. TL 6.8, HL 1.25, HW 1.21, CI 97, SL 1.04, SI 86, PW 0.90, WL 2.08, EL 0.36 (EL/HW 0.30), MfL 1.22 (MfL/HW 1.01, MfL/MfH 4.36) (1 measured).

MALE: unknown.

Holotype worker (top specimen of three on pin), **Madagascar**: Prov. Toliara, Mahafaly Plateau, 6.2 km. 74° ENE Itampolo, 24°39.2'S, 43°59.8'E, 80 m., 21–25.ii.2002, BLF 5814, CASENT0002420, under stone, spiny forest/thicket (*Fisher et al.*) (CASC).

Paratypes. 2 workers on same pin as holotype, 2 workers with same data but CASENT0002421, 1 worker with same data but CASENT0009802 (CASC).

This small form is separated from *notorthotenes* with some reservations. In terms of general morphology and critical indices, workers of the two are similar, but in terms of absolute dimensions there is a distinct and persistent gap between them in the ranges of all measurements, with no trace of intermediates. No species of *Royidris* show any signs of worker dimorphism, but the possibility that the *diminuta* workers represent the undersized first brood of new foundress queens of *notorthotenes* cannot be entirely ruled out. An alternative hypothesis, that *diminuta*, *etiolata* and *notorthotenes* constitute a single species, results in a monomorphic species with SI 115–158, an exceptionally broad range. All three species are found in sympatry in the Mahafaly Plateau.

Both series of *diminuta*, which nests under stones in spiny forest, were included under *notorthotenes* by Heterick (2006).

**Non-paratypic material examined.** **Madagascar**: Prov. Toliara, Mahafaly Plateau, ENE Itampolo (*Fisher et al.*).

### ***Royidris etiolata* Bolton & Fisher sp. n.**

(Figs 51–53, Map 139)

WORKER (holotype in parentheses). TL 3.5–4.2 (3.9), HL 0.88–1.00 (0.98), HW 0.66–0.77 (0.75), CI 75–78 (77), SL 1.04–1.20 (1.14), SI 148–158 (152), PW 0.42–0.50 (0.48), WL 1.14–1.36 (1.30) (11 measured). EL 0.21–0.24 (EL/HW 0.31–0.32). MfL 0.98–1.14 (MfL/HW 1.46–1.50, MfL/MfH 4.00–4.38).

Workers of *etiolata* mostly conform to the description of *notorthotenes*. The two are closely related but separated by the comparative dimensions noted below, most striking of which is the extremely elongate scape. In addition, *etiolata* is a more gracile species. Its head in full-face view has the sides behind the eyes strongly convergent posteriorly, so that the transverse portion of the posterior margin always appears shorter and narrower than in *notorthotenes*. For comparison of measurements see Table 3.

**TABLE 3.** Comparison of measurements between *Royidris etiolata* and *notorthotenes*.

	<i>etiolata</i>	<i>notorthotenes</i>
SL	1.04–1.14	0.86–1.00
SI	148–158	115–132
CI	75–78	78–84
MfL/HW	1.46–1.50	1.28–1.39

QUEEN and MALE: unknown.

Holotype worker, **Madagascar**: Prov. Toliara, Mahafaly Plateau, 6.2 km. 74° ENE Itampolo, 24°39.2'S, 43°59.8'E, 80 m., 21–25.ii.2002, BLF 5796, CASENT0002370, under stone, spiny forest/thicket (*Fisher et al.*) (CASC).

Paratypes. 9 workers with same data as holotype but 3 workers CASENT0002371, 1 worker CASENT0002372, 1 worker CASENT0002437, 3 workers CASENT0002438, 1 worker CASENT0009799 (CASC, BMNH).

The type-series of *etiolata* was included in *notorthotenes* by Heterick (2006), but as the highest SI he records is 132, it would appear that nothing from this series, or the non-paratypic series, was measured. *R. etiolata* nests under stones in spiny forest.



**Non-paratypic material examined.** Madagascar: Prov. Toliara, P.N. Tsimanampetsotsa, Mitoho, ENE Efoetse (Fisher *et al.*).



**FIGURES 51–53.** Lateral, full face and dorsal view of body. *Royidris etiolata* holotype worker CASENT0002370.

***Royidris gravipuncta* Bolton & Fisher sp. n.**  
(Figs 54–56, Map 140)

WORKER (holotype in parentheses). TL 3.0–3.6 (3.5), HL 0.68–0.84 (0.79), HW 0.58–0.72 (0.70), CI 84–89 (89), SL 0.61–0.72 (0.70), SI 95–107 (100), PW 0.39–0.46 (0.45), WL 0.88–1.05 (0.97) (28 measured).

Antennal club 4-segmented. Mandible longitudinally costulate. Scapes of short to moderate relative length (SI 95–107; mean SI 101); when laid straight back in full-face view the apex of the scape slightly exceeds the posterior

margin of the head. With head in full-face view the eyes very close to the midlength of the side of the head capsule. EL 0.19–0.23 (EL/HW 0.31–0.33). Dorsum of head from level of eyes to posterior margin strongly, evenly reticulate-punctate. On each side of the cephalic midline, especially in larger individuals, the margins of the punctures may be aligned, and produce the impression of fine longitudinal striolae. The sculpture does not fade in density and intensity dorsolaterally or posteriorly. Promesonotum in profile convex and swollen, the mesonotum posteriorly descends abruptly to a small, weakly incised, metanotal groove. In absolute profile the propodeal dorsum is horizontal and flat, or very nearly flat; posteriorly dorsum meets the declivity in a rounded right-angle and the declivity is straight and almost vertical. The whole propodeal dorsum is strongly depressed with respect to the highest point of the promesonotum, which is on a considerably higher level. Pronotum with 3–4 pairs of setae; mesonotum with 3–5 pairs; dorsum of propodeum without setae; petiole node with 2 pairs, one apical, the other on the posterior face; postpetiole with setae dorsally and posteriorly; first gastral tergite with numerous suberect setae. All setae are shorter than the maximum vertical diameter of the eye. Entire dorsum of mesosoma finely and densely reticulate-punctate, the sculpture of about equal density and intensity everywhere. Pronotum sometimes also with weak transverse striolae, especially in larger individuals. Entire side of mesosoma finely and densely reticulate-punctate, the sculpture of equal density and intensity everywhere. Metafemur with MfL 0.60–0.72 (MfL/HW 0.95–1.05, MfL/MfH 3.20–3.44). Peduncle of petiole usually unarmed behind the minute subpetiolar process, but in one aberrant paratype there is an elongate, fine cuticular tooth posterior to the process. Postpetiole relatively narrow in dorsal view, maximum width 0.18–0.23 (0.29–0.34 × HW). Sides of petiole node and postpetiole reticulate-punctate; dorsum of postpetiole superficially reticulate-punctate. First gastral tergite superficially microreticulate, at least on the basal half; in most workers the microreticulation is distinct, but in some it is reduced to a faint superficial patterning. Colour of mesosoma, petiole and postpetiole orange-brown to dull reddish brown, the head usually somewhat darker than the mesosoma; the gaster always darker, glossy dark brown to almost black.

QUEEN and MALE: unknown.

Holotype worker (top specimen of three on pin), **Madagascar**: Prov. Toliara, P.N. Tsimanampetsotsa, Mitoho, 6.4 km. 77° ENE Efoetse, 24°03'S, 43°46'E, 40 m., 18–22.iii.2002, BLF 6164, CASENT0485033, at light, spiny forest thicket (*Fisher et al.*) (CASC).

Paratypes. 11 workers with same data as holotype but CASENT0485008, CASENT0485032, CASENT0485034, CASENT0485041, CASENT0485042 (CASC, BMNH).

Material treated as the single species *shuckardi* by Heterick (2006) is here divided into three species. The main mass of this material is now regarded as *gravipuncta*, but a couple of specimens have much longer and denser setae and have been removed to a separate species, *longiseta*. An isolated queen, the only specimen that genuinely represents *shuckardi*, can not be associated with either of these worker-based taxa for reasons discussed under *shuckardi*.

*R. gravipuncta* is the most evenly, densely sculptured species in the genus. The entire dorsal head, and the whole mesosoma, dorsally and laterally, are strongly reticulate-punctate; the density and intensity of the sculpture is consistent on all these surfaces.

The most obvious difference between *gravipuncta* and *longiseta* concerns the setae of the promesonotum and first gastral tergite. In *gravipuncta* the setae are distinctly shorter than the maximum vertical diameter of the eye, whereas in *longiseta* they are obviously longer than the vertical diameter of the eye. In addition, the available specimens of *longiseta* have erect short setae on the propodeum, tend to be somewhat smaller (HW 0.54–0.56), and the sculpture is not as intense or consistently dense as in *gravipuncta*.

The relationship of *gravipuncta* to *peregrina* is very close. The latter appears as a much less densely sculptured version of the former, which also has relatively longer scapes and metatibiae. Unfortunately, the clarity of this division is blurred by four workers from Beanka. Among all the material retrieved from that locality, these four specimens have measurements that are within the *gravipuncta* range (SI 103–107, MfL/HW 1.00–1.06), but exhibit sculpture that is strikingly less dense and uniform than that shown in all other *gravipuncta* material. Their sculpture is however, stronger than is seen in *peregrina*, and microreticulation is retained on the first gastral tergite. For the present, these specimens are tentatively referred to *gravipuncta*, but the possibility that they constitute a separate species, or may indicate that *gravipuncta* and *peregrina* should really be regarded as a single, very variable species, must await later analysis, when more material of possible intermediate forms has become available.

This species has been collected in an urban garden, but is usually found in spiny forest, where it has been collected from under stones, as ground foragers, from pitfall traps, and from dead twigs on the ground. It may also



be found in savannah shrubland and in *Bismarckia* woodland. The type-series was retrieved from a light trap in spiny forest, indicating that it forages by night as well as by day, and that it ascends objects that rise from the forest floor.



FIGURES 54–56. Lateral, full face and dorsal view of body. *Royidris gravipuncta* holotype worker CASENT0906901.

**Non-paratypic material examined. Madagascar:** Prov. Toliara, P.N. Tsimanampetsotsa, Bemanateza (*Fisher et al.*); Prov. Toliara, Betroka (*B.L. Fisher et al.*); Prov. Toliara, Forêt Mahavelo, Isantoria Riv., NE Ifotaka (*Fisher et al.*); Prov. Toliara, Mahafaly Plateau, ENE Itampolo (*Fisher et al.*); Prov. Toliara, Tsihombe (*Fisher et al.*); Prov. Toliara, Tsivory (*Fisher et al.*); Prov. Toliara, Amboasary (*Fisher et al.*); Prov. Mahajanga, Rés. forest Beanka (*B.L. Fisher et al.*); Prov. Fianarantsoa, P.N. Isalo, Isalo II (*A. Ravelomanana*); Prov. Fianarantsoa, Ranohira, Ampandravelo III (*A. Ravelomanana*); Tuléar Berenty Special Reserve (*Rin'Ha & Irwin*).

***Royidris longiseta* Bolton & Fisher sp. n.**  
(Figs 57–59, Map 141)

WORKER (holotype in parentheses). TL 2.7–3.0 (2.7), HL 0.64–0.67 (0.66), HW 0.54–0.56 (0.54), CI 82–84 (82), SL 0.54–0.59 (0.59), SI 100–109 (109), PW 0.36–0.38 (0.36), WL 0.80 – 0.82 (0.80) (3 measured).





FIGURES 57–59. Lateral, full face and dorsal view of body. *Royidris longiseta* holotype worker CASENT0078298.

Antennal club 4-segmented. Mandible longitudinally costulate. Scapes of moderate relative length (SI 100–109); when laid straight back in full-face view the apex of the scape slightly exceeds the posterior margin of the head. With head in full-face view the eyes very close to the midlength of the side of the head capsule. EL 0.16–0.18 (EL/HW 0.30–0.33). Dorsum of head from level of eyes to posterior margin finely reticulate-punctate, the sculpture uniform, effaced in places, or fading out posteriorly. Promesonotum in profile convex and swollen, the mesonotum posteriorly descends abruptly to a small, weakly incised metanotal groove. In absolute profile the propodeal dorsum is horizontal and flat, or very nearly flat; posteriorly dorsum meets the declivity in a rounded right-angle and the declivity is straight and almost vertical. The whole propodeal dorsum is strongly depressed with

respect to the highest point of the promesonotum, which is on a considerably higher level. Pronotum with 4–5 pairs of setae; mesonotum with 3–4 pairs; on both pronotum and mesonotum the longest setae are longer than the maximum vertical diameter of the eye. Dorsum of propodeum with 2–3 pairs of short, standing setae that are less than half the length of those on the mesonotum. Petiole node with 3–4 pairs of setae that arise from the apex and posterior face of the node; postpetiole with numerous long setae that arise from the anterior, dorsal and posterior surfaces of the node; first gastral tergite with numerous long, suberect setae that are at least subequal to the maximum vertical diameter of the eye. Entire dorsum of mesosoma finely and densely reticulate-punctate in type-material, the sculpture of about equal density and intensity everywhere, or weaker on the pronotum (superficial on pronotum in the non-paratypic specimens). Pronotum also with weak transverse striolae in the type-series, but not in the non-paratypic workers. Entire side of mesosoma finely and densely reticulate-punctate, the sculpture of approximately equal density and intensity everywhere in the paratype, but weaker on the pronotum than the mesopleuron in the holotype and partially effaced in the non-paratypic workers. Metafemur with MfL 0.55–0.58 (MfL/HW 1.02–1.07, MfL/MfH 3.63–3.73). Postpetiole relatively narrow in dorsal view, maximum width 0.20–0.21 (0.36–0.39 × HW). First gastral tergite glassy smooth, without trace of superficial microreticulate sculpture. Colour of mesosoma, petiole and postpetiole brown to orange-brown, the head somewhat darker than the mesosoma; the gaster glossy dark brown to black.

QUEEN and MALE: unknown.

Holotype worker, **Madagascar**: Prov. Toliara, Mahafaly Plateau, 6.2 km. 74° ENE Itampolo, 24°39'S, 43°69'E, 80 m., 21–25.ii.2002, BLF 5763, CASENT0078298, pitfall trap, spiny forest/thicket (*Fisher et al.*) (CASC).

Paratype. 1 worker, Prov. Toliara, Tsivory, 24°04.24'S, 46°04.52'E, 400 m., 9.xii.2006, BLF 15869, CASENT0120216, urban/garden (*Fisher et al.*) (CASC).

The holotype of this species was included as part of *shuckardi* by Heterick (2006). *R. longiseta* is closest related to *gravipuncta*, but has distinctly longer promesontal and gastral setae, and also has short erect setae present on the propodeal dorsum.

Only four specimens are referable to this species, one collected from a pitfall trap in spiny forest, two from urban gardens, and one in shrubland. In the paratype and the non-paratypic workers some suberect pubescence is present on the side of the head below the eye, which may be visible in full-face, projecting from below the eye. This feature is absent from the holotype, and its significance is not understood at present.

**Non-paratypic material examined.** **Madagascar**: Prov. Fianarantsoa, Ihosy (*Fisher et al.*); Ranohira, Ampandravelo (*A. Ravelomanana*).

### ***Royidris notorthotenes* (Heterick) comb. n.**

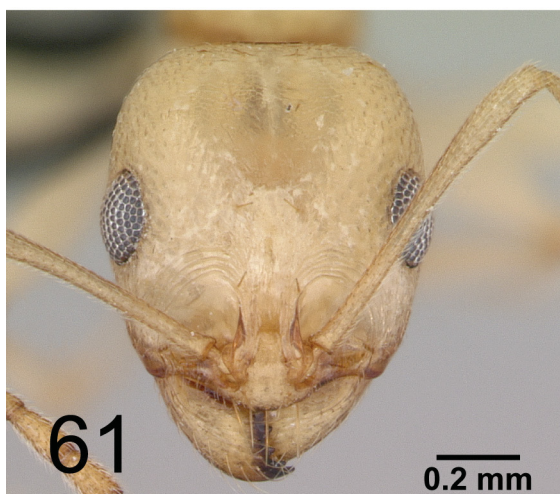
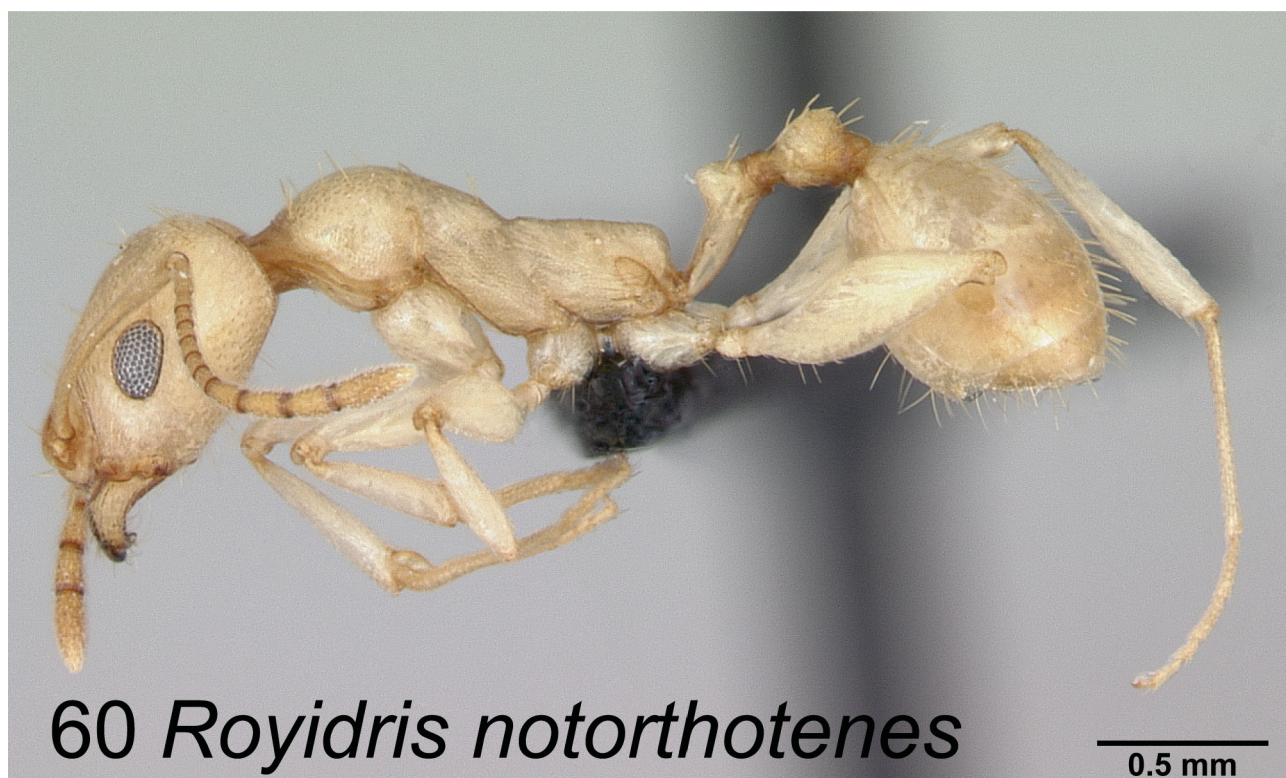
(Figs 60–62, Map 142)

*Monomorium notorthotenes* Heterick, 2006: 91, figs 14, 85–89. Holotype and paratype workers, MADAGASCAR: Prov. Toliara, Rés Cap Sainte Marie, 14.9 km. 261° W Marovato, 25°36'S, 45°09'E, 160 m., 13–19.ii.2002, BLF 5740, under stone, spiny forest thicket, (holotype CASENT0002257) (*Fisher et al.*); other paratypes, series BLF 5741 (workers, queens and males), otherwise with the same collection data as the holotype (CASC, BMNH, ANIC, MCZC) [CASC examined]. **Comb. n.**

WORKER. TL 3.6–4.3, HL 0.80–0.98, HW 0.65–0.81, CI 78–84, SL 0.86–1.00, SI 115–132, PW 0.43–0.51, WL 1.02–1.34 (20 measured).

Antennal club 4-segmented, funicular segments 8 and 9 of equal length. Mandible longitudinally costulate. Scapes relatively long (SI 115–132); when laid straight back in full-face view the apex of the scape very obviously exceeds the posterior margin of the head. With head in full-face view the eyes at the midlength of the side of the head capsule. EL 0.20–0.24 (EL/HW 0.29–0.32). Dorsum of head from level of eyes to posterior margin almost smooth, with only faint, superficial remnants of reticulate or feeble, disorganised punctulate sculpture. Promesonotum in profile convex and swollen, the mesonotum with a long posterior slope that descends to the very feebly indicated metanotal groove. In absolute profile the propodeal dorsum is horizontal, flat to very nearly flat, posteriorly with a bluntly rounded angle. The whole propodeal dorsum is strongly depressed with respect to the highest point of the promesonotum, which is on a considerably higher level. Pronotum with 3–5 pairs of setae;





**FIGURES 60–62.** Lateral, full face and dorsal view of body. *Royidris notorthotenes* holotype worker CASENT0002257.

mesonotum with 2–3 pairs; dorsum of propodeum lacks standing setae. Pronotal dorsum usually with weak, superficial reticulate-punctulate sculpture, at least near the midline; sometimes the sculpture reduced to microreticulation, but the surface never entirely smooth and polished. Propodeal dorsum very finely and densely reticulate-punctulate, the sculpture usually more distinct than on the pronotal dorsum. Side of pronotum superficially microreticulate to weakly reticulate-punctulate; mesopleuron and metapleuron finely and densely reticulate-punctate. Metafemur appears strongly incrassate, with  $MfL$  0.88–1.10 ( $MfL/HW$  1.28–1.39,  $MfL/MfH$  3.62–4.15). Petiole with one pair of setae, on its posterior face near the base; postpetiole with setae on its dorsal and posterior faces; first gastral tergite with numerous suberect setae that are shorter than the maximum vertical diameter of the eye. Postpetiole relatively narrow in dorsal view, maximum width 0.20–0.24 (ca  $0.30 \times HW$ ). Dorsum of postpetiole with very weak reticulate-punctulate or superficial granulate sculpture, sometimes vestigial. First gastral tergite unsculptured, or at most with traces of superficial microreticulate patterning. Entirety of head, mesosoma, petiole, postpetiole, legs and gaster yellow.

QUEEN (gyne). Alate when virgin. Much larger than worker. TL 6.4–7.1, HL 1.24–1.26, HW 1.16–1.22, CI 94–97, SL 1.02–1.04, SI 84–89, PW 0.88–1.02, WL 2.06–2.14, EL 0.36–0.38 (EL/HW 0.30–0.32), MfL 1.20–1.26 (MfL/HW 1.00–1.07, MfL/MfH 4.20–4.40), maximum dorsal length of mesoscutum 1.00–1.05, maximum width of mesoscutum 0.95–1.07, maximum dorsal width of postpetiole 0.42–0.48 (0.38–0.39 × HW) (5 measured). Head somewhat more strongly sculptured than in worker, and with weak longitudinal costulae in front of the ocelli. Mesoscutum unsculptured except for minute, widely scattered pits; mesoscutellum unsculptured, smooth. Propodeal dorsum with fine transverse costulae, between which are traces of superficial punctulation. Petiole, and postpetiole finely reticulate-punctate. First gastral tergite unsculptured, or with superficial vestiges of faint microreticular patterning. Side of mesosoma mostly smooth, with scattered patches of minute weak punctulae or microreticulation. Propodeum rounded to very bluntly and obtusely angular posteriorly, without a well-defined tooth or dentiform angle between dorsum and declivity. All dorsal surfaces except propodeum with numerous fine setae; propodeum entirely lacks setae. Colour generally as in worker, but apex of each gastral tergite with a darker transverse band.

MALE. Smaller than worker, much smaller than queen. HL 0.52–0.54, HW 0.51–0.53, WL 0.98–1.02 (2 measured). Head dorsoventrally flattened, the clypeus not bulging in profile. With head in profile the length of the cephalic dorsum between the posterior ocellus and the occipital carina is much less than the length of the ocellus. See also under diagnosis of genus.

*R. notorthotenes* is part of a small complex, which also includes *diminuta* and *etiolata*, together characterised by a 4-segmented antennal club in which funicular segments 8 and 9 are of equal length, uniform yellow colour, and cephalic sculpture that is weak to vestigial. They all have relatively long scapes (SI 115–158), a head that averages relatively narrow (CI 75–84), and long metafemora (MfL/HW 1.25–1.50). Morphologically, these three species are strikingly similar, but their workers can be separated by their relative dimensions, as discussed under *diminuta* and *etiolata*.

All samples of *notorthotenes* are from spiny forest. They have been discovered nesting under stones and foraging on the ground, and have also been retrieved from pitfall traps.

**Material examined. Madagascar:** Prov. Toliara, Rés. Cap Sainte Marie, W Marovato (*Fisher et al.*); Prov. Toliara, P.N. Tsimanampetsotsa, Bemanateza (*Fisher et al.*); Prov. Toliara, P.N. Tsimanampetsotsa, Mitoho, ENE Efoetse (*Fisher et al.*); Prov. Toliara, SSE Lavanono (*Fisher et al.*); Prov. Toliara, Forêt Tsinjoriaky, E Tsifota (*Fisher et al.*); Prov. Toliara, Mahafaly Plateau, ENE Itampolo (*Fisher et al.*).

### ***Royidris pallida* Bolton & Fisher sp. n.**

(Figs 63–65, Map 143)

HOLOTYPE WORKER. TL 2.5, HL 0.59, HW 0.50, CI 85, SL 0.50, SI 100, PW 0.34, WL 0.72.

Antennal club 3-segmented. Mandible with superficial longitudinal costulae and scattered pits. Scapes relatively short (SI 100); when laid straight back in full-face view the apex of the scape just exceeds the posterior margin of the head. With head in full-face view the eyes very close to the midlength of the side of the head capsule. EL 0.14 (EL/HW 0.28). Dorsum of head from level of eyes to posterior margin smooth and polished; at high magnification some vestiges of superficial reticular patterning are visible, which appear to be the last traces of an almost entirely effaced microreticular pattern. Promesonotum in profile convex and swollen, domed, the mesonotum posteriorly descends abruptly to the commencement of the propodeum, the metanotal groove is absent. In absolute profile the propodeal dorsum is very slightly concave in its anterior one-third, slightly convex in its posterior two-thirds, and ends posteriorly in a bluntly reinforced angle that slightly overhangs the shallowly concave declivity. The whole propodeal dorsum is strongly depressed with respect to the highest point of the promesonotum, which is on a considerably higher level. Dorsa of pronotum and mesonotum each with 2 pairs of setae; dorsum of propodeum lacks setae. Promesonotal dorsum smooth and shining, with vestigial traces of microreticular patterning. Propodeal dorsum very feebly sculptured, but distinctly more strongly than the pronotum. Mesopleuron and metapleuron weakly shagreenate to very feebly, superficially reticulate-punctulate. Metafemur relatively slender, MfL 0.56 (MfL/HW 1.12, MfL/MfH 5.60). Petiole with a pair of setae on the posterior face of the node; postpetiole with a pair dorsally and a transverse row of 4 posteriorly; first gastral tergite with short setae that are quite densely scattered over the entire dorsum. Postpetiole relatively narrow in dorsal view,



maximum width 0.22 ( $0.36 \times \text{HW}$ ). Dorsum of postpetiole and first gastral tergite unsculptured. Colour of head, mesosoma, petiole and postpetiole yellow, the legs and gaster conspicuously lighter, extremely pale yellow to almost white.



FIGURES 63–65. Lateral, full face and dorsal view of body. *Royidris pallida* holotype worker CASENT0085017.

QUEEN and MALE: unknown.

Holotype worker, **Madagascar**: Prov. Toliara, Forêt Tsinjoriaky, 6.2 km. 84° E Tsifota, 22°48'S, 43°25'E, 70 m., 6–10.iii.2002, BLF 5967, CASENT0085017, at light, spiny forest/thicket (Fisher *et al.*) (CASC).

Within the *robertsoni* group, *pallida* is recognised by its pale colour, smooth head, lack of a metanotal groove, relatively short scapes, and relatively slender metafemora.

Known only from the holotype, this beautiful little species was included by Heterick (2006) under *clarinodis*. The single specimen was foraging nocturnally, at a light trap.

***Royidris peregrina* Bolton & Fisher sp. n.**

(Figs 66–68, Map 144)

WORKER (holotype in parentheses). TL 2.6–3.3 (2.9), HL 0.62–0.76 (0.72), HW 0.52–0.67 (0.60), CI 84–88 (85), SL 0.60–0.72 (0.65), SI 108–118 (108), PW 0.34–0.44 (0.40), WL 0.76–0.96 (0.88) (18 measured).

Antennal club 4-segmented. Mandible longitudinally costulate. Scares of moderate relative length (SI 108–118; mean SI 113); when laid straight back in full-face view the apex of the scape distinctly surpasses the posterior margin of the head. With head in full-face view the eyes at the midlength of the side of the head capsule. EL 0.16–0.21 (EL/HW 0.30–0.33). Dorsum of head from level of eyes to posterior margin varies from finely reticulate-punctate to almost unsculptured; the sculpture sometimes uniform but frequently reduced in density and intensity dorsolaterally, or effaced in places, or mostly effaced. Promesonotum in profile convex and swollen, the mesonotum posteriorly descends abruptly to a small, weakly incised metanotal groove. In absolute profile the propodeal dorsum is horizontal and flat, or very nearly flat; posteriorly dorsum meets the declivity in a rounded right-angle and the declivity is straight and almost vertical. The whole propodeal dorsum is strongly depressed with respect to the highest point of the promesonotum, which is on a considerably higher level. Pronotum with 3–5 pairs of setae; mesonotum with 3–4 pairs; dorsum of propodeum without setae; petiole node with 2 pairs, one apical, the other on the posterior face; postpetiole with setae dorsally and posteriorly; first gastral tergite with numerous suberect setae. All setae are shorter than the maximum vertical diameter of the eye. Dorsum of pronotum smooth to weakly, superficially reticulate, distinctly less strongly sculptured than the finely reticulate-punctate propodeal dorsum. Side of pronotum reticulate to weakly reticulate-punctate, this sculpture less strong than on the densely reticulate-punctate mesopleuron. Metafemur with MfL 0.60–0.74 (MfL/HW 1.08–1.13, MfL/MfH 3.50–3.76). Postpetiole relatively narrow in dorsal view, maximum width 0.16–0.20 (0.30–0.31 × HW). Sides of petiole and postpetiole nodes weakly reticulate-punctate; dorsum of postpetiole unsculptured. First gastral tergite glassy smooth, without superficial microreticulation. Colour of mesosoma, petiole and postpetiole variable, yellowish brown, orange-brown or medium brown, the head usually somewhat darker than the mesosoma; the gaster always much darker, very dark brown to black.

QUEEN (gyne). Alate when virgin. Much larger than worker. TL 5.5, HL 0.98, HW 0.84, CI 94, SL 0.78, SI 93, PW 0.68, WL 1.63, EL 0.29 (EL/HW 0.35), MfL 0.84 (MfL/HW 1.00, MfL/MfH 3.82), maximum dorsal length of mesoscutum 0.78, maximum width of mesoscutum 0.74, maximum dorsal width of postpetiole 0.43 (0.51 × HW) (1 measured). Head more coarsely reticulate-punctate than in the worker, and also with fine longitudinal striolae. Mesoscutum more or less smooth along the midline, but on either side with disorganised superficial reticulate-punctation, upon which are superimposed scattered larger punctures. Mesoscutellum with similar but much reduced sculpture, almost smooth. Propodeal dorsum reticulate-punctate and with fine transverse costulae. Petiole, postpetiole and first gastral tergite finely reticulate-punctate, on the first gastral tergite the sculpture densest and coarsest in the basal half, becoming weaker and more superficial posteriorly. Side of pronotum and mesopleuron very weakly reticulate-punctate, metapleuron and side of propodeum much more strongly so. Propodeum terminates in a pair of broadly triangular, tooth-like angles. All dorsal surfaces except propodeum with numerous fine setae; propodeum has one erect pair present. Colour as in worker.

MALE. Known from only two specimens; gaster of the first missing, head and gaster of the second missing. Smaller than worker, much smaller than queen. HL 0.47, HW 0.41, WL 0.94. Head not dorsoventrally flattened, the clypeus bulging in profile. Ocelli at highest point of vertex; outline of dorsum descends steeply behind ocellus to the sharp occipital carina; with head in profile the length of the cephalic dorsum between the posterior ocellus and the occipital carina is greater than the length of the ocellus. See also under diagnosis of genus.

Holotype worker, **Madagascar**: Makay Mts, 21.34109°S, 45.18054°E, 500 m., 28.xi.2010, BLF 25314, CASENT0209249, barren rock with sparse vegetation, burned grass (*B.L. Fisher et al.*) (CASC).

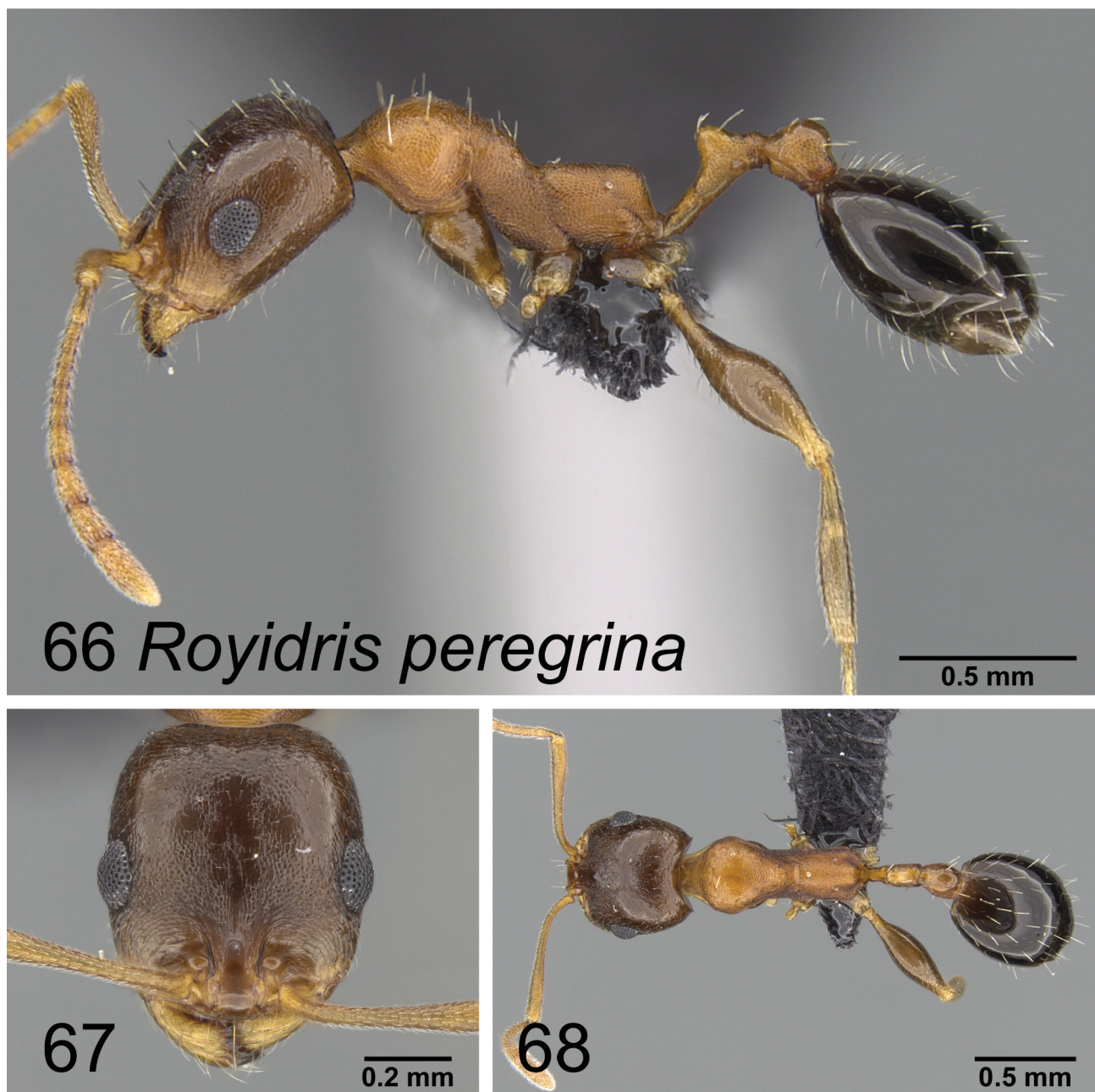
Paratypes. 2 workers with same data as holotype but one BLF 25303, CASENT0209248, the other BLF 25318, CASENT0203840 (CASC).

This species closely resembles *gravipuncta*, but has much less strongly developed sculpture, and has relatively slightly longer scapes and metatibiae (SI and MfL/HW in *gravipuncta* 95–107, and 0.95–1.05, respectively). In addition, *peregrina* has the dorsum of the postpetiole unsculptured, and the first gastral tergite is glassy smooth, lacking superficial microreticulation. In *gravipuncta* the dorsum of postpetiole is superficially reticulate-punctate, and the first gastral tergite is usually obviously superficially microreticulate, at least on the basal half and usually everywhere.



As well as being found running on barren rocks, this species has also been discovered in savannah shrubland and burned savannah.

**Non-paratypic material examined.** Madagascar: Prov. Toliara, Makay Mts (*B.L. Fisher et al.*); Prov. Mahajanga, Rés. forest Beanka (*B.L. Fisher et al.*).



**FIGURES 66–68.** Lateral, full face and dorsal view of body. *Royidris peregrina* ergatoid holotype worker CASENT0209249.

***Royidris pulchra* Bolton & Fisher sp. n.**

(Figs 69–71, Map 145)

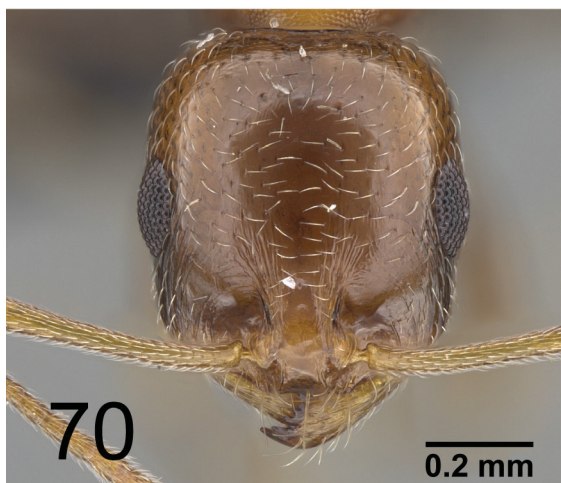
**HOLOTYPE WORKER.** TL 3.0, HL 0.70, HW 0.59, CI 84, SL 0.66, SI 112, PW 0.42, WL 0.87.

Antennal club 3-segmented. Mandible longitudinally costulate. Scares of relatively moderate length (SI 112); when laid straight back in full-face view the apex of the scape exceeds the posterior margin of the head. With head in full-face view the eyes very close to the midlength of the side of the head capsule. EL 0.19 (EL/HW 0.32). Dorsum of head from level of eyes to posterior margin smooth and polished, with scattered minute punctulae.





69 *Royidris pulchra*



FIGURES 69–71. Lateral, full face and dorsal view of body. *Royidris pulchra* holotype worker CASENT0052581.

Promesonotum in profile convex and swollen, domed, the mesonotum posteriorly descends steeply to the commencement of the propodeum, the metanotal groove is absent. In absolute profile the propodeal dorsum, from its junction with the mesonotum, rises slightly posteriorly to about the level of the propodeal spiracle, behind which it descends slightly to the bluntly rounded posterior angle; the declivity is straight and almost vertical. The whole propodeal dorsum is strongly depressed with respect to the highest point of the promesonotum, which is on a considerably higher level. Pronotum with a seta at the right humeral angle but not at the left; without other pronotal setae in the holotype but it is possible that a more posterior pair was lost by abrasion. Mesonotum with 2 pairs of short setae; dorsum of propodeum lacks setae. Pronotal dorsum smooth and shining; propodeal dorsum superficially reticulate-punctulate, more strongly sculptured than the pronotum. Lower side of pronotum weakly, superficially reticulate-punctulate to reticulate-shagreenate, this sculpture fading out on the upper half of the side.



Mesopleuron reticulate-punctulate, metapleuron similarly sculptured and also with some weak longitudinal costulae. Metafemur relatively long and slender, MfL 0.78 (MfL/HW 1.32, MfL/MfH 6.00). Petiole with a pair of setae at the apex of the node, and with another pair on its posterior face; postpetiole with setae dorsally and posteriorly; first gastral tergite with numerous suberect setae that are shorter than the maximum vertical diameter of the eye. Postpetiole relatively narrow in dorsal view, maximum width 0.22 ( $0.37 \times \text{HW}$ ). Dorsum of postpetiole and first gastral tergite unsculptured. Colour of head, mesosoma, petiole, postpetiole and legs medium brown, the gaster black.

QUEEN and MALE: unknown.

Holotype worker, **Madagasacar**: Mahajanga, Forêt Ambohimanga, 26.1 km. 314° Mampikony, 250 m., 15°57.76'S, 47°26.29'E, 13–15.xii.2004, BLF 11757, CASENT0052581, tropical dry forest (*B.L. Fisher*) (CASC).

A member of the *robertsoni* group, *pulchra*, like *pallida*, combines characters of unsculptured head and lack of a metanotal groove within the group. Apart from the strikingly different colour of these two species, *pulchra* is larger than *pallida*, has a relatively longer scape, larger eye, and longer metafemur; it also has two pairs of petiolar setae, as opposed to one in *pallida*.

### ***Royidris robertsoni* (Heterick) comb. n.**

(Figs 72–74, Map 146)

*Monomorium robertsoni* Heterick, 2006: 93, figs 14, 37. Holotype and paratype workers: holotype, MADAGASCAR: Prov. Toliara, Ranobe, 23°02'03"S, 43°36'43"E, 30 m., 13–19.ii.2002, Frontier Project, MGF056(5), sifted litter, spiny forest thicket, CASENT0003501; one paratype worker with same data but MGF054; two paratype workers, Prov. Toliara, Mandarano, 23°31'38"S, 44°05'15"E, 70 m., 10.v.2002, Frontier project, MGF030, sifted litter, gallery forest (CASC, BMNH; MCZC) [CASC examined]. **Comb. n.**

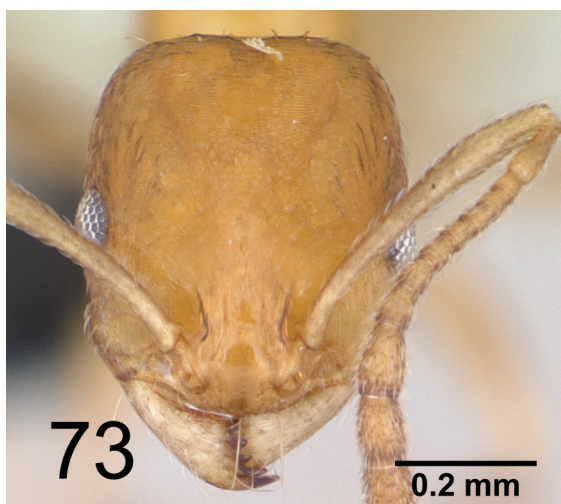
WORKER. TL 2.4–2.6, HL 0.56–0.62, HW 0.46–0.54, CI 82–87, SL 0.50–0.54, SI 100–109, PW 0.34–0.38, WL 0.66–0.78 (4 measured).

Antennal club 3-segmented. Mandible longitudinally costulate. Scares of short to relatively moderate length (SI 100–109); when laid straight back in full-face view the apex of the scape just exceeds the posterior margin of the head. With head in full-face view the eyes very close to the midlength of the side of the head capsule. EL 0.12–0.14 (EL/HW 0.24–0.28). Dorsum of head to the level of the posterior margins of the eyes finely, densely shagreenate, with some weak, superficial striolae, the whole surface appearing silky; behind the level of the eyes, close to the posterior margin, the sculpture is mainly of extremely fine, dense transverse striolae. Promesonotum in profile convex and swollen, the mesonotum posteriorly descends abruptly to the commencement of the propodeum; there is no strongly defined, V-shaped metanotal groove. In absolute profile the propodeal dorsum slopes downward posteriorly and rounds evenly into the declivity through a broad, shallow curve, without an angle between dorsum and declivity; the declivity itself continues the outward slope posteriorly, its outline not vertical or concave. The whole propodeal dorsum is strongly depressed with respect to the highest point of the promesonotum, which is on a considerably higher level. Pronotum with 1–3 pairs of setae (usually 2); mesonotum with 2 pairs; dorsum of propodeum lacks setae. Promesonotal dorsum shagreenate-striolate; propodeal dorsum shagreenate, sometimes also with feeble striolae present. Side of mesosoma finely shagreenate everywhere, the sculpture tends to be weakest on the side of the pronotum, coarser and sometimes somewhat punctulate on the mesopleuron, and extremely fine and dense on the metapleuron, where it is usually distinctly finer than on the mesopleuron. Metafemur with MfL 0.50–0.58 (MfL/HW 1.07–1.09, MfL/MfH 3.86–4.50). Petiole with a single pair of setae posteriorly, near the apex of the node; postpetiole with setae dorsally and posteriorly; first gastral tergite with numerous suberect setae. Postpetiole relatively narrow in dorsal view, maximum width 0.17–0.20 ( $0.37 \times \text{HW}$ ). Dorsum of postpetiole and first gastral tergite unsculptured. Colour uniformly yellow, or the gaster may be paler or partially infuscated.

QUEEN and MALE: unknown.

The most densely and universally sculptured member of the *robertsoni* group, this species can be immediately characterised by the long, very smoothly rounded, even transition from propodeal dorsum to declivity. The species has been retrieved from litter samples and pitfall traps in spiny forest.

**Material examined.** **Madagascar**: Prov. Toliara, Ranobe (MGF); Prov. Toliara, Forêt Tsinjoriaky, E Tsifota (*Fisher et al.*).



FIGURES 72–74. Lateral, full face and dorsal view of body. *Royidris robertsoni* holotype worker CASENT0035010.

***Royidris shuckardi* (Forel) comb. n.**

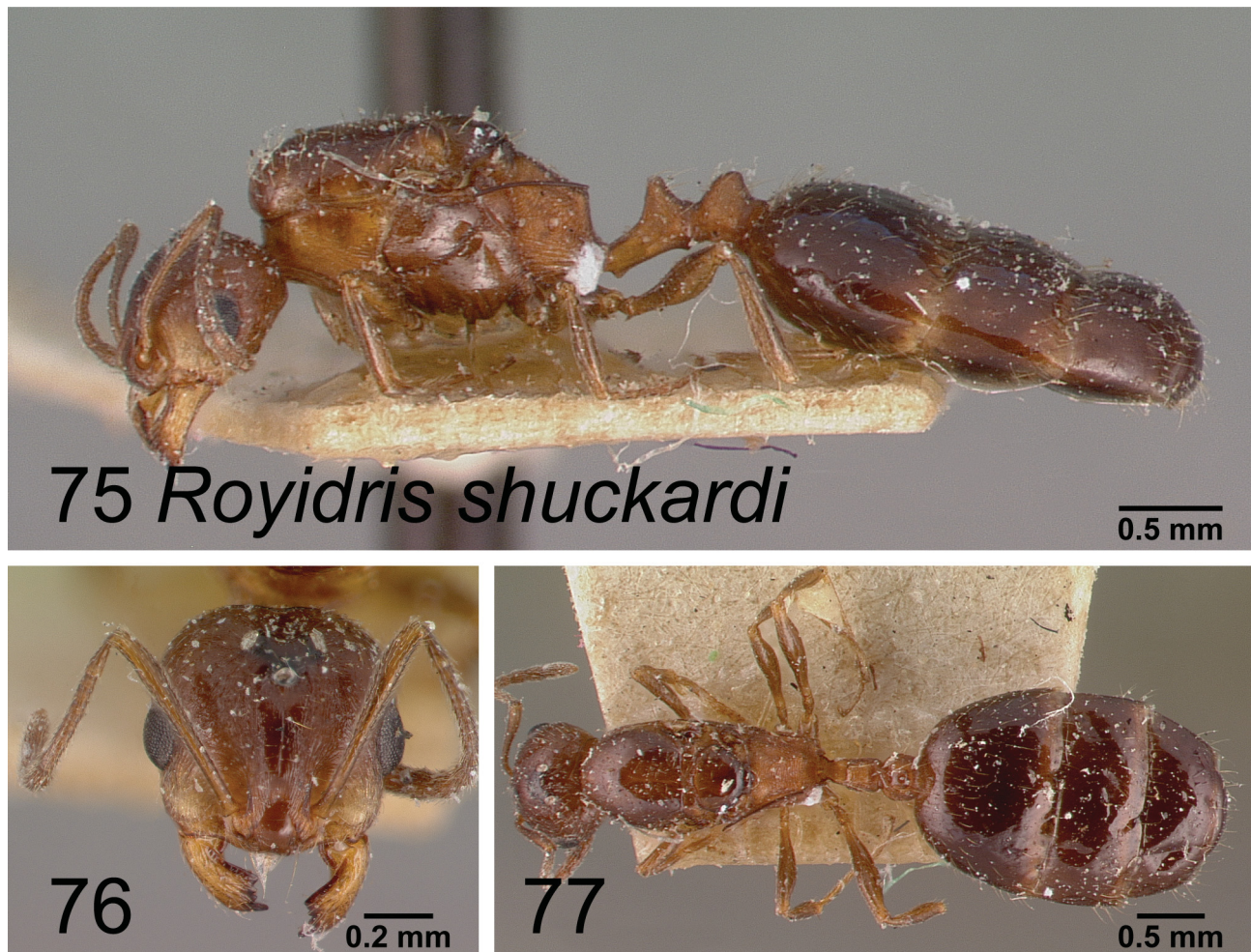
(Figs 75–77, Map 147)

*Monomorium shuckardi* Forel, 1895: 251. Holotype queen, MADAGASCAR: Moramanga (*Sikora*) (MHNG) [examined].  
**Comb. n.**

QUEEN (gyne). Alate when virgin. Among the few known queens of the *gravipuncta* complex, *shuckardi* is isolated because with its head in full-face view the eyes are located in front of the midlength of the sides, and the



sides behind the eyes appear long and shallowly convex, convergent posteriorly through long, shallow curves, and with the posterior margin short and indented medially. In the worker-associated queen of *peregrina*, and the two unassociated queens that are known in the complex, the eyes are at, or very close to, the midlength, and the sides behind the eyes round through narrow curves into a broad posterior margin that is shallowly concave across its width.



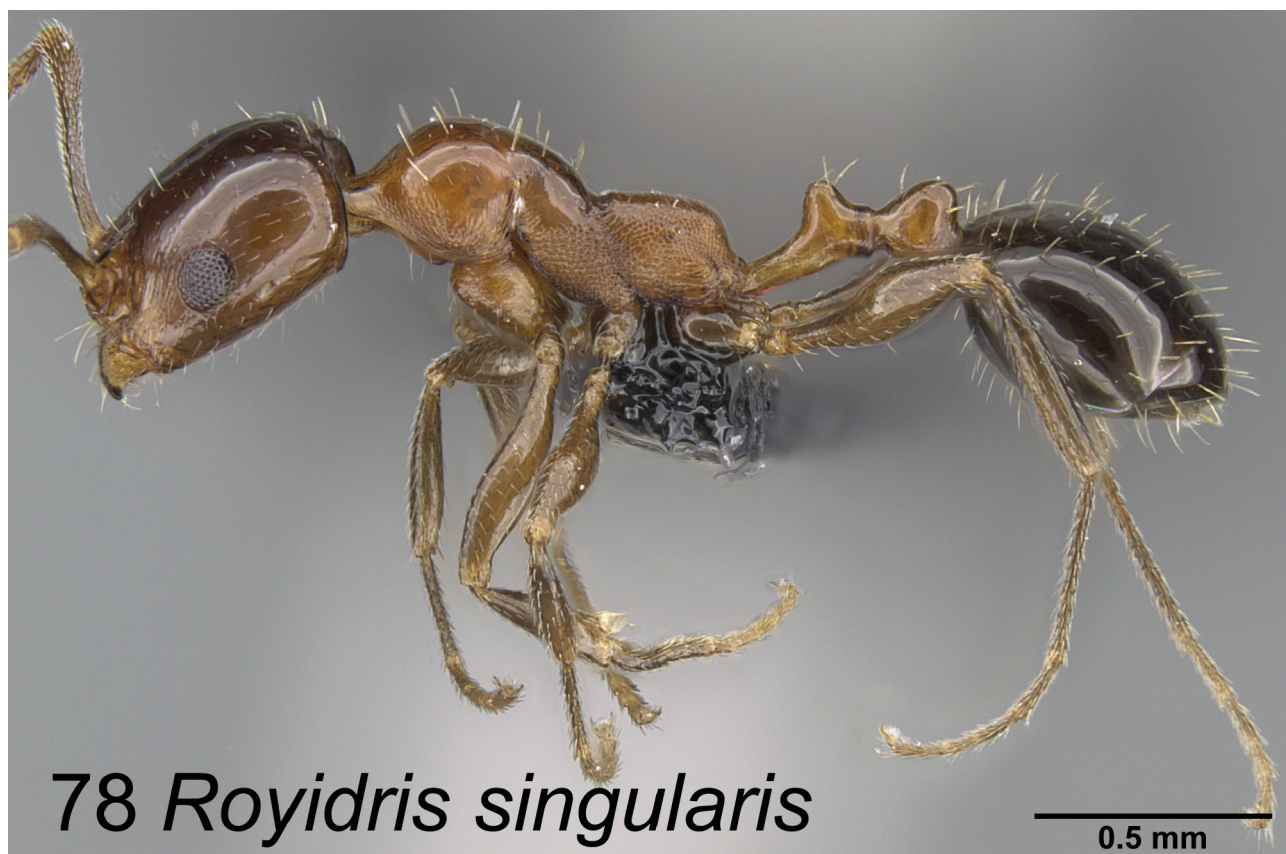
FIGURES 75–77. Lateral, full face and dorsal view of body. *Royidris shuckardi* holotype queen CASENT0010761.

WORKER and MALE: unknown.

This species is known only from the holotype queen. While it certainly belongs in *Royidris*, and because of its 4-segmented antennal club is referable to the *notorthotenes* group, it can not be matched with any other queen assigned to that group. In addition, as pointed out by Heterick (2006), its type-locality, Moramanga, is in Toamasina Province, hundreds of kilometers away from the range of, and with vegetation and conditions very different from, that inhabited by other species now in *Royidris*.

Heterick (2006) associated the isolated *shuckardi* holotype queen with workers of what is now considered a complex of three worker-based species, *gravipuncta*, *longiseta*, and the more recently discovered *peregrina*. He grouped the first two species together with the isolated queen, and regarded them as a single species, to which he applied the name *shuckardi*. However, there is no evidence for this association. None of the few queens associated with, or assumed to belong to the same group as the three worker-based species, corresponds to the holotype of *shuckardi*. Heterick (2006) suggests that the locality given for the *shuckardi* queen may be in error. This could be correct, but even if true the queen can not be linked to any known species. Resolution of the identity of *shuckardi* will require the acquisition and comparison of more samples of worker-associated queens.





FIGURES 78–80. Lateral, full face and dorsal view of body. *Royidris singularis* holotype worker CASENT0128362.

***Royidris singularis* Bolton & Fisher sp. n.**

(Figs 78–80, Map 148)

HOLOTYPE WORKER. TL 2.0, HL 0.64, HW 0.53, CI 83, SL 0.64, SI 121, PW 0.37, WL 0.82.

Antennal club 4-segmented. Mandible longitudinally costulate. Scapes relatively long (SI 121); when laid straight back in full-face view the apex of the scape exceeds the posterior margin of the head. With head in full-face view the eyes very close to the midlength of the side of the head capsule. EL 0.15 (EL/HW 0.28). Dorsum of head from level of eyes to posterior margin smooth and polished, unsculptured except for scattered minute punctulae. Promesonotum in profile convex and swollen, the mesonotum posteriorly descends steeply to the metanotal groove, which is narrowly but distinctly impressed. In absolute profile the propodeal dorsum is horizontal, flat to very shallowly convex, posteriorly with a bluntly rounded angle; the declivity is steeply oblique, not vertical. The whole propodeal dorsum is strongly depressed with respect to the highest point of the promesonotum, which is on a considerably higher level. Pronotum with 3 pairs of setae; mesonotum also with 3 pairs; dorsum of propodeum



lacks similar standing setae. Pronotal dorsum smooth and shining, polished; propodeal dorsum superficially reticulate-punctulate. Lower side of pronotum weakly reticulate-punctulate, this sculpture fading out on the upper half of the side. Mesopleuron and metapleuron finely reticulate-punctate. Metafemur with MfL 0.60 (MfL/HW 1.13, MfL/MfH 4.29). Petiole with two pairs of setae, one at the apex of the node, and the other on its posterior face near the apex; postpetiole with setae on its anterior and posterior faces; first gastral tergite with numerous suberect setae that are shorter than the maximum vertical diameter of the eye. Postpetiole relatively narrow in dorsal view, maximum width 0.18 ( $0.34 \times \text{HW}$ ). Dorsum of postpetiole and first gastral tergite unsculptured. Colour of head, mesosoma, petiole, postpetiole and legs brown, the head slightly darker than the medium brown mesosoma; gaster black.

QUEEN and MALE: unknown.

Holotype worker, **Madagasacar**: Iharanandriana, 19°09.49'S, 47°29.82'E, 1513 m., 9.v.2007, BLF 17570, CASENT0128362, uapaca woodland (Fisher *et al.*) (CASC).

Known only from the holotype and one other worker, this member of the *notorthotenes* group is characterised by its colour, glassy smooth head and dorsal pronotum, and its relative dimensions as mentioned under the *gravipuncta* group diagnosis, above. In colour, *singularis* is reminiscent of *pulchra* and *anxietas*, two members of the *robertsoni* group, but in both these species the antennal club is of 3 segments and the metanotal groove is absent. In addition, *pulchra* is a larger species, with shorter scapes, distinctly larger eyes and longer metafemora; compare *pulchra* HW 0.66, SI 112, EL/HW 0.32, MfL/HW 1.32 with the measurements of *singularis*, above. In the case of *anxietas*, its scapes are shorter (SI 100–110) than in *singularis* (SI 121), the head of *anxietas* has reticulate-punctulate sculpture, and its propodeum usually has a standing short seta close to the posterior angle.

Both specimens were found in uapaca woodland.

**Non-paratypic material examined. Madagasacar**: Mampiarika, Ambositra (*A. Ravelomanana*).

## Genus *Vitsika*

(Figs 81–122, Maps 149–162)

### *Vitsika* Bolton & Fisher gen. n.

Type-species: *Vitsika crebra* sp. n., by present designation.

### Diagnosis of worker

Monomorphic myrmicine ants.

Mandible triangular; masticatory margin with 6–8 teeth and longer than the basal margin.

Palp formula 5,3.

Stipes of maxilla with a strong transverse crest; portion of stipes distal to the crest distinctly depressed and concave.

Clypeus with longitudinal rugulae on median portion, two of which may be enhanced to produce a weakly bicarinate appearance; posteriorly moderately narrowly inserted between the frontal lobes (width of clypeus between the frontal lobes about equal to the width of one lobe).

Clypeus with an unpaired median seta that arises just above a narrow anterior clypeal apron.

Clypeus with lateral portions not raised into a shielding wall or sharp ridge in front of the antennal sockets.

Frontal carinae present, divergent posteriorly, extending back almost to the posterior margin of the head.

Antennal scrobes present, above the eye.

Antenna with 12 segments, with an apical club of 3 segments.

Torulus with upper lobe concealed by the frontal lobe in full-face view, or its extreme outer edge just visible.

Eyes present, in dorsal view located slightly to distinctly in front of the midlength of the side of the head capsule.

Head capsule without a median, longitudinal carina; occipital carina conspicuous.

Pronotal humeri angulate to weakly, obtusely dentate in dorsal view.

Promesonotum more or less evenly shallowly convex in profile, not swollen or domed; propodeal dorsum in profile continues the line of the promesonotum.

Promesonotal suture absent; metanotal groove absent or present.

Propodeum strongly bispinose; propodeal lobes small and rounded.

Propodeal spiracle behind the midlength of the sclerite, in profile well below the dorsal margin, and one spiracle diameter or slightly more in front of the margin of the declivity; one spiracle diameter or less from the apex of the metapleural gland bulla.

Metasternal process absent; a pair of low carina arise anterior to the metasternal pit and diverge posteriorly, one on each side of the pit.

Tibial spurs: mesotibia 0 or 1; metatibia 0 or 1; sometimes the spurs extremely reduced, hardly distinguishable from the setae at the tibial apices.

Abdominal segment 2 (petiole) with a long anterior peduncle, with a dentiform anteroventral process; spiracle situated from slightly behind to distinctly in front of midlength of peduncle.

Abdominal segment 2 node narrow, high-domed to cuneate in profile; ventral surface indented and angled below the node.

Stridulitrum present on pretergite of abdominal segment 4.

Abdominal segment 4 (first gastral) tergite does not broadly overlap the sternite on the ventral gaster; gastral shoulders absent.

Sting simple, strongly developed.

Main pilosity of dorsal head and body consists of simple setae, present and numerous on all dorsal surfaces of head and body. Scapes with elevated pubescence but without standing setae. Dorsal (outer) surfaces of mesotibiae and metatibiae with standing setae present.

Sculpture. Basically similar in all species. Mandibles superficially sculptured to weakly longitudinally costulate; sculpture tends to fade out towards the masticatory margin. Dorsum of head between frontal carinae longitudinally costulate, the costulae divergent posteriorly; spaces between costulae with reticulate-punctulate ground-sculpture that varies from weak to pronounced. Costulae never form a reticulum anywhere on the head, but a few anastomoses may occur near the posterior margin. Area within scrobe predominantly reticulate-punctulate, sometimes also with a few weak rugulae; above the eye usually with 1–3 longitudinal costulae or rugulae. Dorsum of mesosoma reticulate-rugose, most strongly developed on pronotum. Side of pronotum reticulate-rugose towards the dorsum, more longitudinally rugose on lower half of side. Mesopleuron with sparse (*ca* 5–7) longitudinal rugae, at least the lower ones oblique; these rugae usually extend onto the metapleuron. Gaster unsculptured.

**TABLE 4.** Presence of alate, intermediate and ergatoid gynes in *Vitsika*.

Species	alate gyne	alate-ergatoid intermediate	ergatoid gyne
<i>acclivitas</i>	+		
<i>astuta</i>	+		
<i>breviscapa</i>			+
<i>crebra</i>	+		
<i>disjuncta</i>	+		
<i>incisura</i>			+
<i>labes</i>			+
<i>manifesta</i>	+	+	+
<i>miranda</i>	+		
<i>procera</i>			+
<i>susplicax</i>	+	+	+
<i>tenuis</i>	+		
<i>venustas</i>	+		+

### Diagnosis of queen (gyne)

Queens are known for all species except *obscura*. Characters are as in the worker, except for the usual developments of the mesosoma seen in alates. The queens may be alate or ergatoid, or both forms may occur within a single species (see Table 4). It is possible that all species will be found to produce both ergatoids and alates when the species are better represented in collections. Two species (*manifesta*, *susplicax*) exhibit morphological intermediates between alate and ergatoid forms, and two species (*acclivitas* and *crebra*) appear to be polygynous. The alate queen has three distinct ommatidia and a characteristically large mesosoma with a full complement of flight sclerites; the pronotum is well represented on the dorsal mesosoma, and the mesopleuron has a strong



transverse sulcus. Ergatoids have a mesosoma that is usually larger than in true workers but much smaller than in alates. The mesonotum is frequently hypertrophied in ergatoids with respect to the worker caste, and 1–3 ommatidia are usually present, although only a vestigial median ocellus may remain; there is no transverse sulcus on the mesopleuron. Intermediates between these two extremes exhibit a mesosoma that is alate-like but much smaller in size, usually with most or all sclerites of the pterothorax represented but in a reduced form, fused together, and with no trace of wing attachments; 3 ocelli are always present in these forms. Venation: see under male.

## Diagnosis of male

Worker-associated males are known for *crebra*, *breviscapa* and *labes*. In addition, the males of three other species, collected in isolation (in Malaise traps), are present in CASC. Similar in size to the conspecific worker or slightly smaller. Mandible triangular and distinctly dentate, with 5–7 teeth. Palp formula 5,3 (*in situ* counts). Stipital crest present on maxilla. SI 30–52. Antenna with 13 segments, conspicuously not filiform, characteristically modified. First funicular segment short but not globular, about 0.40–0.60 × the length of the second funicular segment. Funiculus segment 8 (= antennal segment 9) about equal in length to the scape. Funiculus segment 9 (= antennal segment 10) strikingly elongate, 1.45–1.80 × SL, and the funiculus with a kink or angle between the elongate ninth segment and the tenth. The three apical funicular segments (10–12) are also elongate and form a slender club, of which at least the apical segment is longer than SL (sometimes 2 or all 3 apical segments are > SL). Eyes large, located at or in front of the midlength of the sides. Ocelli conspicuous. Occipital carina sharp but not forming a raised crest. Mesoscutum in profile strongly overhangs the pronotum, the latter not visible in dorsal view. Mesotibia and metatibia each with a single, simple spur. Notauli variably developed, from vestigial to having anterior arms present. Mesopleuron with a transverse sulcus present. Propodeum usually unarmed and rounded, but in some the posterodorsal angle is reinforced by a carina, or the angle projects as a low, obtuse tooth; propodeal lobes rounded. Petiole in profile slightly longer than postpetiole. Petiole with an anterior peduncle, the spiracle at, or slightly in front of, the midlength of the peduncle, well in front of the level of the low, rounded node. Subpetiolar process minute to absent. Parameres large. Cerci present. Pilosity simple everywhere.

Forewing venation (based on males of six species, and alate queens of *crebra* and *miranda*). Rs·f4–5 does not meet R·f3 on anterior margin of wing (= marginal cell open). 2rs-m absent. 1m-cu present. Fusion of Rs+M extended distally, so that 1m-cu arises from Rs+M, not from M. Rs·f3 present (Rs+M divides into Rs·f3 and M·f3-4 proximal of the junction with 2r-rs). M·f3-4 is usually represented only by a short stub (entirely absent in the single alate queen of *miranda*). First discal cell small, its anterior margin (Rs+M) only about half the length of its posterior margin (Cu·f1-2). A·f2 absent or a mere stub distal to cu-a; the latter is retracted and arises from M+Cu, proximal of the point where it divides into M·f1 and Cu·f1-2.

## Preliminary key to *Vitsika* males

- |   |  |                   |
|---|--|-------------------|
| 1 | Propodeal dorsum, or the upper half of the propodeal declivity, or both, with a median, longitudinal carina.....   | 2                 |
| - | Propodeal dorsum and declivity without trace of a median longitudinal carina.....  | 5                 |
| 2 | Postpetiole in dorsal view very obviously longer than broad (W/L <i>ca</i> 0.80).....  | <b>labes</b>      |
| - | Postpetiole in dorsal view broader than long (W/L > 1.00).....   | 3                 |
| 3 | Propodeal median longitudinal carina is absent from the declivity; it is confined to the dorsum and terminates in a pair of obliquely laterally directed carinae at the junction of dorsum and declivity. In profile the propodeum armed with a very low, broadly triangular tooth; the apex of this tooth, in posterior view, is seen as the junction of 4–5 short carinae..... | <b>male sp. A</b> |
| - | Propodeal median longitudinal carina is present on the upper half of the declivity, and may be present or absent along the dorsum. Propodeum unarmed, or at most with a low, rounded carina, without a broad triangular tooth and without a confluence of 4–5 carinae in posterior view.....   | 4                 |
| 4 | Median longitudinal carina absent from propodeal dorsum. Colour entirely yellow. Scape relatively long, SL 0.27 (SI <i>ca</i> 50); funiculus segment 9 <i>ca</i> 1.57 × SL.....  | <b>crebra</b>     |
| - | Median longitudinal carina present on propodeal dorsum. Colour entirely dark brown. Scape relatively short, SL 0.20 (SI <i>ca</i> 32); funiculus segment 9 <i>ca</i> 1.47 × SL.....  | <b>male sp. B</b> |
| 5 | Postpetiole in dorsal view longer than broad. Colour dull yellow with infuscated patches. Upper arc of eye surrounded by a broad, shallow trench.....  | <b>breviscapa</b> |
| - | Postpetiole in dorsal view broader than long. Colour dark brown. Upper arc of eye not surrounded by a broad, shallow trench.....   | <b>male sp. C</b> |

Diagnoses of the males of *breviscapa*, *crebra* and *labes* are given under species discussions. Critical characterisations of the unassociated males are as follows.

**Male sp. A:** HL 0.71, HW 0.58, CI 82, SL 0.20, SI 34, mesoscutum maximum width 0.66, WL 1.16, EL 0.34, MfL 0.92. Propodeal dorsum with a broad, open rugoreticulum anteriorly, near the metanotum. Propodeum with a median longitudinal carina that is restricted to the dorsum and does not extend onto the declivity. Propodeum in profile with a low, broad triangular prominence at junction of dorsum and declivity, the apex of which, in dorsal or posterior view, is seen as the confluence of 4–5 short carinae. Postpetiole in dorsal view broader than long. Colour dark brown. [Specimen data: Prov. Fianarantsoa, Forêt d'Ambalagoavy Nord, MA-01-12-01, CASENT0995378 (*Harin'Hala et al.*) (CASC).] Only two worker-based species have been recorded from Fianarantsoa Prov., *miranda* and *obscura*; this male may belong to one of them.

**Male sp. B:** HL 0.71, HW 0.63, CI 89, SL 0.20, SI 32, mesoscutum maximum width 0.63, WL 1.16, EL 0.31, MfL 0.88. Propodeal dorsum reticulate-punctate, with weak longitudinal rugulae laterodorsally, and also with a longitudinal median carina that extends along the dorsum and down the upper half of the declivity. Propodeum on each side with an elevated but rounded, raised crest that separates declivity from sides. Postpetiole in dorsal view broader than long. Colour dark brown. [Specimen data: Prov. Toliara, P.N. Andohahela, ESE Mahamavo, Malaise trap, BLF 5009, CASENT0080565 and 0080566 (*Fisher et al.*) (CASC).]

**Male sp. C:** HL 0.58, HW 0.49, CI 84, SL 0.20, SI 41, mesoscutum maximum width 0.50, WL 0.88, EL 0.26, MfL 0.66. Propodeal dorsum almost unsculptured, with only faint traces of weak punctulation. Propodeum without a median longitudinal carina on either the dorsum or the declivity. Declivity separated from sides of propodeum by a very fine carina; in profile the propodeum appears unarmed and the dorsum rounds evenly into the declivity. Postpetiole in dorsal view broader than long. Colour dark brown. [Specimen data: Prov. Toamasina, Ankerana, BLF 27860, CASENT0275575 (*B.L. Fisher et al.*) (CASC).]

### Comments on *Vitsika*

The 14 species discussed here present a strikingly uniform appearance in terms of sculpture and pilosity, as well as an extremely limited range of standard indices. They obviously represent a very compact single group. Unfortunately, *Vitsika* workers are currently diagnosed among the myrmicines only by the presence of a unique combination of characters. As with many other myrmicine genera no unique morphological apomorphy can yet be cited. It is defined by its possession of the following characters in combination: mandible with 6 or more teeth; palp formula 5,3; stipital crest strongly present; antenna 12-segmented, with a 3-segmented club; clypeus with an isolated median seta set above a narrow anterior apron; clypeus posteriorly narrowly inserted between the frontal lobes; frontal carinae present and long, extending almost to the posterior margin of the head; antennal scrobes present; mesosomal dorsal outline simple; petiole pedunculate; first gastral tergite does not overlap the sternite on the ventral surface of the gaster; gastral shoulders absent.

### Synopsis of *Vitsika* species

*acclivitas* Bolton & Fisher **sp. n.**  
*astuta* Bolton & Fisher **sp. n.**  
*breviscapa* Bolton & Fisher **sp. n.**  
*crebra* Bolton & Fisher **sp. n.**  
*disjuncta* Bolton & Fisher **sp. n.**  
*incisura* Bolton & Fisher **sp. n.**  
*labes* Bolton & Fisher **sp. n.**  
*manifesta* Bolton & Fisher **sp. n.**  
*miranda* Bolton & Fisher **sp. n.**  
*obscura* Bolton & Fisher **sp. n.**  
*procera* Bolton & Fisher **sp. n.**  
*susplicax* Bolton & Fisher **sp. n.**  
*tenuis* Bolton & Fisher **sp. n.**  
*venustas* Bolton & Fisher **sp. n.**



## Key to *Vitsika* species (workers)

Note. This key excludes ergatoid gynes and alate-ergatoid intermediates (*i.e.* any worker-like individual which possesses a hypertrophied mesonotum, or has 1–3 ocelli, or has both these features present, is omitted).

- 1 Full adult colour red-brown, dark brown, or almost black; decidedly not yellow ..... 2
- Full adult colour yellow to light brownish yellow ..... 6
- 2 With petiole node in posterior view the dorsal margin markedly concave across part or most of the width ..... *incisura*
- With petiole node in posterior view the dorsal margin convex, varying from shallowly convex to almost conical ..... 3
- 3 In profile the postpetiole almost paniform (Fig. 99), long and low, the node distinctly longer than the postpetiole is high, and with a long, shallowly convex dorsal outline ..... *labes*
- In profile the postpetiole distinctly nodiform (Figs 102, 105, 108), the node at least as high as the postpetiole is long, usually higher, and the node with a strongly convex dorsal outline ..... 4
- 4 In posterior view the dorsum of the petiole node is very narrowly rounded, rising medially to a point that is blunt to acute. Petiole node in posterior view tall and slender, higher than wide, its height (from midpoint of the dorsal margin of the foramen to the apex)  $1.10\text{--}1.23 \times$  its maximum width ..... *manifesta*
- In posterior view the dorsum of the petiole node is broadly and shallowly convex to almost flat medially. Petiole node in posterior view low and broad, wider than high, its height (from midpoint of the dorsal margin of the foramen to the apex)  $0.78\text{--}0.92 \times$  its maximum width. .... 5
- 5 Smaller species, HL  $0.78\text{--}0.84$ , HW  $0.62\text{--}0.73$ , SL  $0.54\text{--}0.63$ , WL  $1.00\text{--}1.08$ . Metafemur shorter, MfL  $0.68\text{--}0.78$  (MfL/HW  $1.06\text{--}1.09$ ). Antennal scape brown, about the same shade as the head capsule or fractionally lighter (Fig. 106). Full adult colour of head and mesosoma blackish brown to black. Mesopleuron with 7–8 relatively crowded longitudinal costulae, the spaces between them with weak punctulate ground-sculpture. .... *miranda*
- Larger species, HL  $0.91\text{--}0.92$ , HW  $0.75\text{--}0.78$ , SL  $0.68\text{--}0.69$ , WL  $1.20\text{--}1.22$ . Metafemur longer, MfL  $0.86\text{--}0.88$  (MfL/HW  $1.11\text{--}1.16$ ). Antennal scape yellow, conspicuously lighter in shade than the head capsule (Fig. 109). Full adult colour of head and mesosoma brown. Mesopleuron with 5–6 relatively widely spaced longitudinal costulae, the spaces between them almost entirely smooth ..... *obscura*
- 6 Dorsum of postpetiole entirely covered with dense, conspicuous reticulate-punctate ground sculpture, and also with some weak rugulae. Propodeal spines short and their apices close together in relation to postpetiole width (Figs 90, 92): in dorsal view maximum width of postpetiole  $1.95\text{--}2.25 \times$  the length of a propodeal spine; maximum width of postpetiole  $1.25\text{--}1.50 \times$  the distance between the apices of the propodeal spines. In addition, postpetiole in dorsal view  $1.35\text{--}1.45 \times$  broader than long ..... *crebra*
- Dorsum of postpetiole usually smooth, but sometimes with weak or partial punctulation, or with a few laterodorsal costulae. Propodeal spines always longer and their apices closer together in relation to postpetiole width: in dorsal view maximum width of postpetiole  $0.90\text{--}1.60 \times$  the length of a propodeal spine; maximum width of postpetiole  $0.82\text{--}1.22 \times$  the distance between the apices of the propodeal spines. In addition, postpetiole in dorsal view  $1.00\text{--}1.38 \times$  broader than long. .... 7
- 7 Antennal scape relatively shorter, SI 73–76. Propodeal spines relatively shorter, maximum dorsal width of postpetiole  $1.25\text{--}1.60 \times$  the length of a spine (only rarely  $< 1.30$ ). Metafemur always slightly shorter than head width (MfL/HW  $0.85\text{--}0.92$ ). Petiole node in profile low, thick from front to back, and with an oblique to broadly rounded dorsal surface (Fig. 87). .... *breviscapa*
- Antennal scape relatively longer, SI 80–91. Propodeal spines relatively longer, maximum dorsal width of postpetiole  $0.90\text{--}1.36 \times$  the length of a spine (only extremely rarely  $> 1.25$ ). Metafemur about the same length as, or slightly longer than, head width (MfL/HW  $0.98\text{--}1.13$ ). Petiole node in profile high, narrow from front to back, and usually narrowly rounded to bluntly cuneate dorsally ..... 8
- 8 In profile the postpetiole almost paniform, long and low, the node distinctly longer than the postpetiole is high, and with a shallowly convex dorsal outline. (Fig. 120) ..... *venustus*
- In profile the postpetiole distinctly nodiform, the node at least as high as the postpetiole is long, usually higher, and the node with a strongly convex dorsal outline ..... 9
- 9 With petiole in profile the dorsal surface of the peduncle runs into the anterior face of the node through a very obtuse angle, so that the anterior face of the node slopes upwards and posteriorly at only a shallow angle relative to the dorsum of the peduncle (Fig. 81). .... *acclivitas*
- With petiole in profile the dorsal surface of the peduncle runs into the anterior face of the node through slightly more than a right-angle, so that the anterior face of the node slopes upwards and posteriorly at a steep angle relative to the dorsum of the peduncle (Figs 84, 93, 114, 117). .... 10
- 10 Average size of worker larger, HW  $0.60\text{--}0.71$ , SL  $0.54\text{--}0.62$ , MfL  $0.66\text{--}0.80$ . Petiole node smooth, without costulae or rugulae on the anterior, lateral or posterior surfaces. Postpetiole in dorsal view smooth, without punctulate sculpture and without longitudinal costulae laterodorsally. .... *astuta*
- Average size of worker smaller, HW  $0.48\text{--}0.62$ , SL  $0.38\text{--}0.52$ , MfL  $0.48\text{--}0.66$ . If HW  $0.60\text{--}0.62$  and SL  $0.50\text{--}0.52$ , then petiole in profile with fine costulae or rugulae that ascend the anterior surface, traverse the upper portion of the lateral surface, and usually overlap onto the posterior surface. Postpetiole in dorsal view with weak but obvious punctulate sculpture, at least on the posterior half, and laterodorsally with longitudinal costulae present ..... 11
- 11 With mesosoma in profile the dorsal outline of the propodeum rises to a marked peak or angle posterior to the site of the metanotal groove, then descends abruptly and steeply to the dorsal base of the propodeal spine (Fig. 93). Petiole node entirely unsculptured ..... *disjuncta*
- With mesosoma in profile the dorsal outline of the propodeum is usually evenly, shallowly curved from the site of the metano-

- tal groove to the dorsal base of the propodeal spine. If a weak angular prominence is present in the outline of the propodeal dorsum, then the petiole node has sculpture on some or all of its surfaces . . . . . 12
- 12 Eye smaller, with 5–6 longitudinal rows of ommatidia, and with 6–7 ommatidia in the longest row. Smaller species, WL 0.62–0.74, MfL 0.45–0.52, HW 0.46–0.52, SL 0.38–0.45. Postpetiole in dorsal view  $1.20\text{--}1.38 \times$  broader than long. Propodeal spines usually (but not always) strikingly downcurved along their length (Fig. 117) . . . . . *tenuis*
- Eye larger, with 7–8 longitudinal rows of ommatidia, and with 9–10 ommatidia in the longest row. Larger species, WL 0.84–0.96, MfL 0.54–0.66, HW 0.53–0.60, SL 0.46–0.52. Postpetiole in dorsal view  $1.08\text{--}1.20 \times$  broader than long. Propodeal spines never strikingly downcurved along their length (Figs 111, 115) . . . . . 13
- 13 With petiole node in profile its sculpture conspicuous, with distinct costulae or rugulae that ascend the anterolateral surface, traverse the upper side of the node, and usually overlap onto the posterior surface. Dorsum of postpetiole mostly to entirely weakly punctulate, and also with laterodorsal longitudinal costulae present . . . . . *procera*
- With petiole node in profile its sculpture weak to vestigial, at most with very feeble, slender costulae that ascend the anterolateral surface, and with traces of punctulate sculpture laterally; posterior surface of node smooth. Dorsum of postpetiole mostly to entirely unsculptured, at most with some weak punctulation posteriorly, and laterodorsal longitudinal costulae or weak punctulation may be present . . . . . *susplicax*

## Species of *Vitsika*

### *Vitsika acclivitas* Bolton & Fisher sp. n.

(Figs 81–83, Map 149)

WORKER (holotype in parentheses). TL 2.5–3.0 (2.7), HL 0.56–0.66 (0.61), HW 0.48–0.55 (0.53), CI 83–87 (87), SL 0.38–0.46 (0.42), SI 80–85 (80), PW 0.35–0.45 (0.40), WL 0.66–0.80 (0.77) (10 measured).

Eye with 6 rows of ommatidia, and with 7–8 ommatidia in the longest row; EL 0.13–0.16 (EL/HW 0.26–0.29). MfL 0.44–0.56 (MfL/HW 0.96–1.01). Propodeal spiracle relatively small, diameter of annulus of propodeal spiracle is usually slightly less than the thickness of the propodeal spine at its midlength. Petiole node large, tall and characteristically shaped: in profile the dorsal surface of the peduncle is continuous with the anterior face of the node, the two run together through a very obtuse angle, so that the anterior face of the node slopes upwards and posteriorly only shallowly relative to the dorsum of the peduncle. The anterior face of the petiole node rises to the short, narrowly rounded dorsum, and the posterior face has about the same degree of slope as the anterior. Height of petiole node in posterior view (from midpoint of the dorsal margin of the foramen to the apex)  $0.82\text{--}0.89 \times$  its maximum width. In dorsal view postpetiole  $1.10\text{--}1.18 \times$  broader than long; maximum width of postpetiole  $1.15\text{--}1.36 \times$  the length of a propodeal spine; maximum width of postpetiole  $0.90\text{--}1.00 \times$  the distance between the apices of the propodeal spines. Length of postpetiole node in profile about equal to the height of the segment. Disc of postpetiole usually with some weak punctulate sculpture, especially on the posterior half. Full adult colour yellow.

QUEEN (gyne). Only alates known; may be polygynous as several queens appears in one series. HL 0.65–0.70, HW 0.56–0.60, CI 86–88, SL 0.44–0.47, SI 77–79, PW 0.52–0.56, WL 0.90–0.98, maximum width of mesoscutum 0.50–0.54, maximum length of mesoscutum 0.48–0.53, MfL 0.56–0.60 (MfL/HW 0.85–1.00) (3 measured). With three distinct ocelli, a full complement of flight sclerites and a conspicuous sulcus across the mesopleuron. The shape of the petiole node parallels that seen in the worker.

MALE: unknown.

Holotype worker, **Madagascar**: Prov. Antsiranana, Forêt Bekaraoka, 6.8 km. 60° ENE Daraina, 7–9.xii.2003, 13°10.0'S, 49°42.6'E, sifted litter, tropical dry forest, BLF 9872(22), CASENT0044902 (Fisher *et al.*) (CASC).

Paratypes. 1 worker and 1 dealate queen, with same data as holotype and all BLF 9872: worker, (2) CASENT0044917; queen, (2) CASENT0044916 (CASC).

Among the small, yellow species of *Vitsika*, *acclivitas* is distinguished by its much less erect petiole node. The node shape that seems most similar is that of *venustas*, but in that species the anterior face of the petiole node is not as shallowly inclined, and the postpetiole in profile has a node that is visibly longer than the height of the segment.





FIGURES 81–83. Lateral, full face and dorsal view of body. *Vitsika acclivitas* worker CASENT0044902.

Almost all the specimens were from leaf litter samples in tropical dry forest. Only the two queens that constitute the NE Andapa sample were from rainforest.

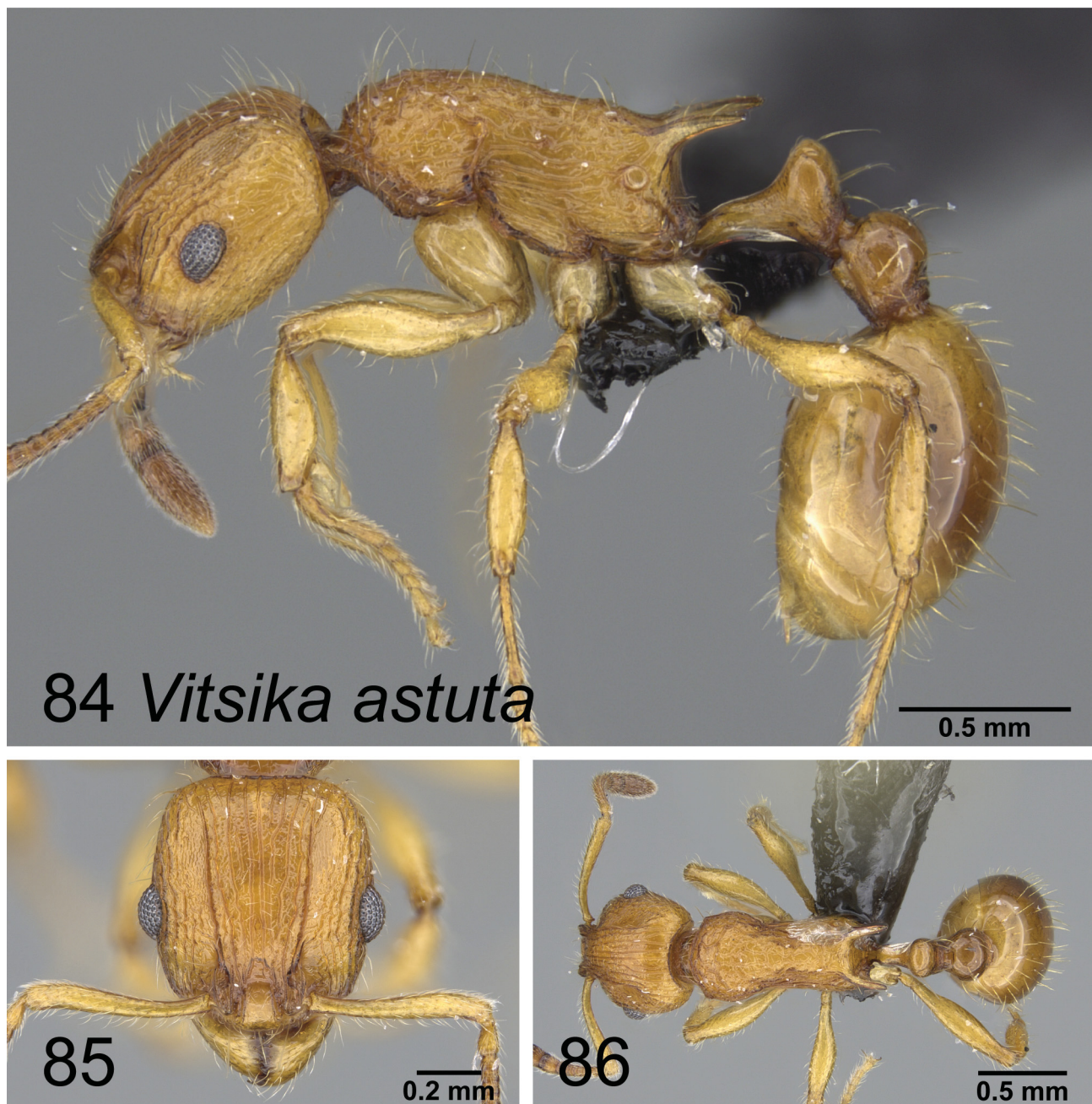
**Non-paratypic material examined.** **Madagascar:** Prov. Antsiranana, Forêt Antsahabe, W Daraina (*Fisher et al.*); Prov. Antsiranana, Rés. Analamerana, Anivorano-Nord (*B.L. Fisher*); Prov. Antsiranana, P.N. Marojejy, NE Andapa (*Fisher et al.*).

***Vitsika astuta* Bolton & Fisher sp. n.**  
(Figs 84–86, Map 150)



WORKER (holotype in parentheses). TL 3.2–3.7 (3.6), HL 0.74–0.85 (0.80), HW 0.60–0.71 (0.69), CI 82–86 (86), SL 0.54–0.66 (0.60), SI 85–90 (87), PW 0.46–0.55 (0.52), WL 0.88–1.08 (1.02) (10 measured).

Eye with 8–9 rows of ommatidia, and with 9–11 ommatidia in the longest row; EL 0.17–0.21 (EL/HW 0.27–0.30). MfL 0.66–0.80 (MfL/HW 1.06–1.13). Median portion of clypeus with two carinae on each side, the area



**FIGURES 84–86.** Lateral, full face and dorsal view of body. *Vitsika astuta* holotype worker CASENT0248549.

between them smooth. In profile, the dorsal outline of the propodeum flat to shallowly convex, without a distinct peak in its outline posterior to the mesonotal-propodeal junction. Propodeal declivity without transverse costulae, or at most with weak vestiges present. Diameter of annulus of propodeal spiracle is at least equal to the thickness of the propodeal spine at its midlength. Petiole node in profile cuneate, slightly inclined anteriorly, entirely unsculptured; in posterior view low and broad, its dorsal surface broadly rounded. Height of petiole node in posterior view (from midpoint of the dorsal margin of the foramen to the apex)  $0.90\text{--}1.00 \times$  its maximum width. In dorsal view postpetiole  $1.20\text{--}1.32 \times$  broader than long; maximum width of postpetiole  $0.94\text{--}1.04 \times$  the length of a propodeal spine; maximum width of postpetiole  $0.86\text{--}0.96 \times$  the distance between the apices of the propodeal spines. Postpetiole node in profile relatively short and strongly convex dorsally, the length of the node in profile is



distinctly less than the height of the segment. Disc of postpetiole entirely smooth, glossy, without trace of lateral longitudinal costulae. Dorsal (outer) surface of the metatibia with a few suberect that are setae long and fine, at least as long as the maximum tibial width. Full adult colour yellow.

QUEEN (gyne). Only alates known. HL 0.88–0.90, HW 0.75–0.76, CI 84–85, SL 0.63–0.66, SI 84–87, PW 0.62–0.64, WL 1.26–1.28, maximum width of mesoscutum 0.56–0.60, maximum length of mesoscutum 0.56–0.60, MfL 0.82 (2 measured).

MALE: unknown.

Holotype worker, **Madagascar**: Prov. Antsiranana, R.S. Manongarivo, 17.3 km. 218° SW Antanambao, 1580 m., 14°01.3'S, 48°25.1'E, 27.x.1998, sifted litter (leaf mold, rotten wood), montane rainforest, BLF 1970(50)-13, (no CASENT number) (*B.L. Fisher*) (CASC).

Paratypes. 6 workers, 3 dealate queens, with same data as holotype and all BLF 1970: workers, (05) CASENT0192036, (11) CASENT0127746, (16) CASENT0192020, (22)-13 (no CASENT number), (50) CASENT019202, (50)-12 (no CASENT number); queens, (22)-11 (no CASENT number), (49)-9 (no CASENT number), (no BLF code) CASENT0178900 (CASC, BMNH).

The largest of the yellow species of *Vitsika*, *astuta* actually appears to be more closely related to darkly coloured species such as *miranda* and *obscura*. Comments on their separation are given under those names.

Specimens of *astuta* have been found in leaf litter, in rotten logs, and in living plant stems, in rainforest.

**Non-paratypic material examined.** **Madagascar**: Prov. Antsiranana, R.S. Manongarivo, SW Antanambao (*B.L. Fisher*); Prov. Toliara, NW Enakara, Rés. Andohahela (*B.L. Fisher*).

### ***Vitsika breviscapa* Bolton & Fisher sp. n.**

(Figs 87–89, Map 151)

WORKER (holotype in parentheses). TL 2.3–2.6 (2.6), HL 0.58–0.70 (0.52), HW 0.50–0.59 (0.52), CI 82–86 (83), SL 0.38–0.44 (0.39), SI 73–76 (75), PW 0.34–0.40 (0.34), WL 0.68–0.80 (0.70) (15 measured).

Eye with 6–7 rows of ommatidia, and with 8–9 ommatidia in the longest row; EL 0.14–0.17 (EL/HW 0.28–0.30). MfL 0.46–0.52 (MfL/HW 0.85–0.92). Propodeal spines in profile short, diameter of annulus of propodeal spiracle is greater than the thickness of the propodeal spine at its midlength. Petiole node low and relatively long, usually appearing quite squat and blocky in profile. Anterior face of petiole node rises steeply to the anterodorsal angle; the dorsal face is long and slopes down posteriorly; there is usually a blunt angle posteriorly between the dorsal face and the short posterior face, but this angle is sometimes rounded and inconspicuous. Height of petiole node in posterior view (from midpoint of the dorsal margin of the foramen to the apex) 0.95–1.07 × its maximum width. In dorsal view postpetiole 1.10–1.20 × broader than long; maximum width of postpetiole 1.25–1.60 × the length of a propodeal spine; maximum width of postpetiole 1.00–1.22 × the distance between the apices of the propodeal spines. Length of postpetiole node in profile slightly less than the height of the segment. Disc of postpetiole entirely smooth, glossy. Full adult colour yellow.

QUEEN (gyne). Only ergatoids known (*e.g.* CASENT0496288). HL 0.68–0.72, HW 0.57–0.62, CI 83–86, SL 0.44–0.46, SI 71–78, PW 0.41–0.45, WL 0.82–0.84, EL 0.17–0.18 (EL/HW 0.28–0.29), MfL 0.54–0.56 (MfL/HW 0.90–0.95) (4 measured). Usually with only the median ocellus developed, and frequently this ocellus very reduced; sometimes with 3 ocelli, the median distinct and the posterior pair reduced. The mesonotum is scarcely more inflated than in the workers. It is possible that the largest individuals regarded as workers here may actually be extreme ergatoids.

MALE. HL 0.52–0.54, HW 0.42–0.43, CI 78–83, SL 0.16–0.18, SI 37–43, mesoscutum width at maximum 0.40–0.42, WL 0.82–0.84, EL 0.24, MfL 0.60 (2 measured). Propodeum unarmed; propodeal dorsum unsculptured; propodeal dorsum and declivity without trace of a median longitudinal carina. Postpetiole in dorsal view longer than broad. Dorsal arc of eye, from midpoint of anterior margin to midpoint of posterior margin, bounded by a marked impression in the cuticle of the head capsule. Scape only very slightly longer than funiculus segment 2 (antennal segment 3); scape about equal in length to funiculus segment 8; funiculus segment 9 easily the longest antennal segment (*ca* 0.24); funiculus segments 10 and 11 each about equal in length to the scape; apical antennal segment (funiculus segment 12) almost 2 × SL. Colour dull yellow, with infuscated patches, especially dorsum of head around the ocelli.

Holotype worker (top specimen of 3 on pin), **Madagascar**: Prov. Toamasina, Mont. Akirindro, 7.6 km. 341° NNW Ambinanitelo, 15°17.3'S, 49°32.9'E, 600 m., 17–21.iii.2003, ex Melastomataceae, BLF 8284, CASENT0496230 (Fisher *et al.*) (CASC).



**FIGURES 87–89.** Lateral, full face and dorsal view of body. *Vitsika breviscapa* holotype worker CASENT0914141.

Paratypes. 2 workers mounted on pin below holotype; 2 workers with same data but CASENT0496231 (CASC).

The immediate distinguishing features of *breviscapa* workers are the combination of yellow colour, relatively short scapes (the shortest in the genus), metafemur that is always shorter than HW, and propodeal spines that are shorter than in all other species except *crebra*. Confusion with *crebra* should be impossible as the postpetiole in *crebra* is entirely densely sculptured, its postpetiole in dorsal view is 1.35–1.45 × broader than long, and its SI is 85–91. In addition, in *crebra*, the anterior curvature of the outline of the eye in profile is very similar to the posterior curvature, whereas in *breviscapa* the eye is more obviously tear-drop shaped, with an outline that is much more narrowly rounded and pointed anteriorly than posteriorly.

A few specimens of *breviscapa* have been recovered from leaf litter samples in rainforest, but the great majority were captured in association with plants of the family Melastomataceae. The biology of the ant-plant association is not known, but *breviscapa* appears to be the only known member of *Vitsika* that is plant-associated.



**Non-paratypic material examined. Madagascar:** Prov. Toamasina, Mont. Anjanaharibe, NNE Ambinanitelo (*Fisher et al.*); Prov. Toamasina, Mont. Akirindro, NNW Ambinanitelo (*Fisher et al.*).

***Vitsika crebra* Bolton & Fisher sp. n.**

(Figs 90–92, Map 152)

WORKER (holotype in parentheses). TL 3.0–3.7 (3.5), HL 0.69–0.84 (0.80), HW 0.55–0.69 (0.65), CI 79–84 (81), SL 0.49–0.61 (0.60), SI 86–91 (91), PW 0.42–0.54 (0.51), WL 0.84–1.07 (1.02) (25 measured).

Eye with 7–8 rows of ommatidia, and with 9–10 ommatidia in the longest row; EL 0.18–0.23 (EL/HW 0.30–0.34). Eye in profile not tear-drop shaped, not coming to a point anteriorly; the anterior and posterior curvatures of the eye almost equally convex. MfL 0.60–0.76 (MfL/HW 1.03–1.15). Oblique costulae on mesopleuron sparse and weak. In profile, the dorsal outline of the propodeum forms an even slope from just behind the metanotal groove to the base of the spine. Propodeal declivity lacks transverse costulae. Diameter of annulus of propodeal spiracle is slightly less than, to about equal to, the thickness of the short propodeal spine at its midlength. Petiole node in posterior view low and broad, its posterior surface usually with some reticulate-punctulate sculpture, at least on the lower half. Height of petiole node in posterior view (from midpoint of the dorsal margin of the foramen to the apex) 0.75–0.90 × its maximum width. In dorsal view postpetiole 1.33–1.42 × broader than long; maximum width of postpetiole 1.95–2.25 × the length of a propodeal spine; maximum width of postpetiole 1.25–1.50 × the distance between the apices of the propodeal spines. Disc of postpetiole entirely sculptured with reticulate-punctulation, and also usually with some weak rugulae present. Full adult colour uniform yellow.

QUEEN (gyne). Only alates known; may be polygynous as more than one queen appears in some series. HL 0.80–0.86, HW 0.68–0.72, CI 84–86, SL 0.56–0.60, SI 81–85, PW 0.58–0.62, WL 1.14–1.18, MfL 0.72–0.76 (4 measured). As in the worker the postpetiole is very broad and entirely sculptured dorsally, and the propodeal spines are short.

MALE. HL 0.65, HW 0.54, CI 83, SL 0.27, SI 50, mesoscutum width at maximum 0.52, WL 1.00, EL 0.27, MfL 0.64 (1 measured). Propodeal dorsum finely punctulate and with scattered fine, longitudinal rugulae. Propodeal dorsum without a median longitudinal carina, but upper half of declivity with a median carina present; a fine rugula on each side separates the declivity from the side of the propodeum. Propodeum in profile unarmed, the rounded angle between dorsum and declivity surmounted by a an extremely low, rounded cuticular crest. Postpetiole in dorsal view broader than long, the surface finely punctulate-shagreenate. Postpetiole in profile longer than high. Colour yellow.

Holotype worker, **Madagascar:** Prov. Mahajanga, P.N. Tsingy de Bemaraha, 10.6 km. 123° ESE Antsalova, 150 m., 18°43'S, 44°43'E, 16–20.xi.2001, sifted litter, tropical dry forest, BLF 4432(1), CASENT0473810 (*Fisher et al.*) (CASC).

Paratypes. 7 workers and 2 dealate queens, with same data as holotype and all BLF 4432: workers, (6) CASENT0473811, (10) CASENT0473813, (12) CASENT0473814, (14) CASENT0473815, (18) CASENT0473818, (19) CASENT0473819, (40) CASENT0473809; queens, (15) CASENT0473816, (27) CASENT0473822 (CASC). [The nine paratype specimens were selected from leaf litter series BLF 4432, which contains another 18 workers and 2 dealate queens, all in CASC.]

One of the most easily recognised species of *Vitsika*. The combination of yellow colour, short propodeal spines, and very broad postpetiole that is uniformly densely sculptured dorsally, is not repeated anywhere else in the genus.

All examples of this species originate in tropical dry forest. They have been found as ground foragers, in pitfall traps, in litter samples, in rotten logs, in dead twigs above the ground, and by beating low vegetation.

**Non-paratypic material examined. Madagascar:** Prov. Mahajanga, Tsingy de Bemaraha, ESE Antsalova (*Fisher et al.*); Prov. Mahajanga, Tsingy de Bemaraha, E Bekopaka (*Fisher et al.*); Prov. Mahajanga, Tsingy de Bemaraha, ENE Bekopaka (*Fisher et al.*); Prov. Mahajanga, Forêt de Tsimembo, NNW Soatana (*Fisher et al.*); Prov. Mahajanga, Res. Bemarivo, SW Besalampy (*Fisher et al.*); Prov. Mahajanga, P.N. Ankarafantsika, Ampijoroa, NW Andranofasika (*Rabeson et al.*); Prov. Mahajanga, P.N. Namoroka, NW Vilanandro (*Fisher et al.*); Prov. Mahajanga, P.N. Baie de Baly, NNW Soalala (*Fisher et al.*); Prov. Mahajanga, Rés. forest Beanka (*B.L. Fisher*), Prov. Antsiranana, Forêt Anabohazo, WSW Maromandia (*Fisher et al.*).



FIGURES 90–92. Lateral, full face and dorsal view of body. *Vitsika crebra* holotype worker CASENT0473810.

***Vitsika disjuncta* Bolton & Fisher sp. n.**

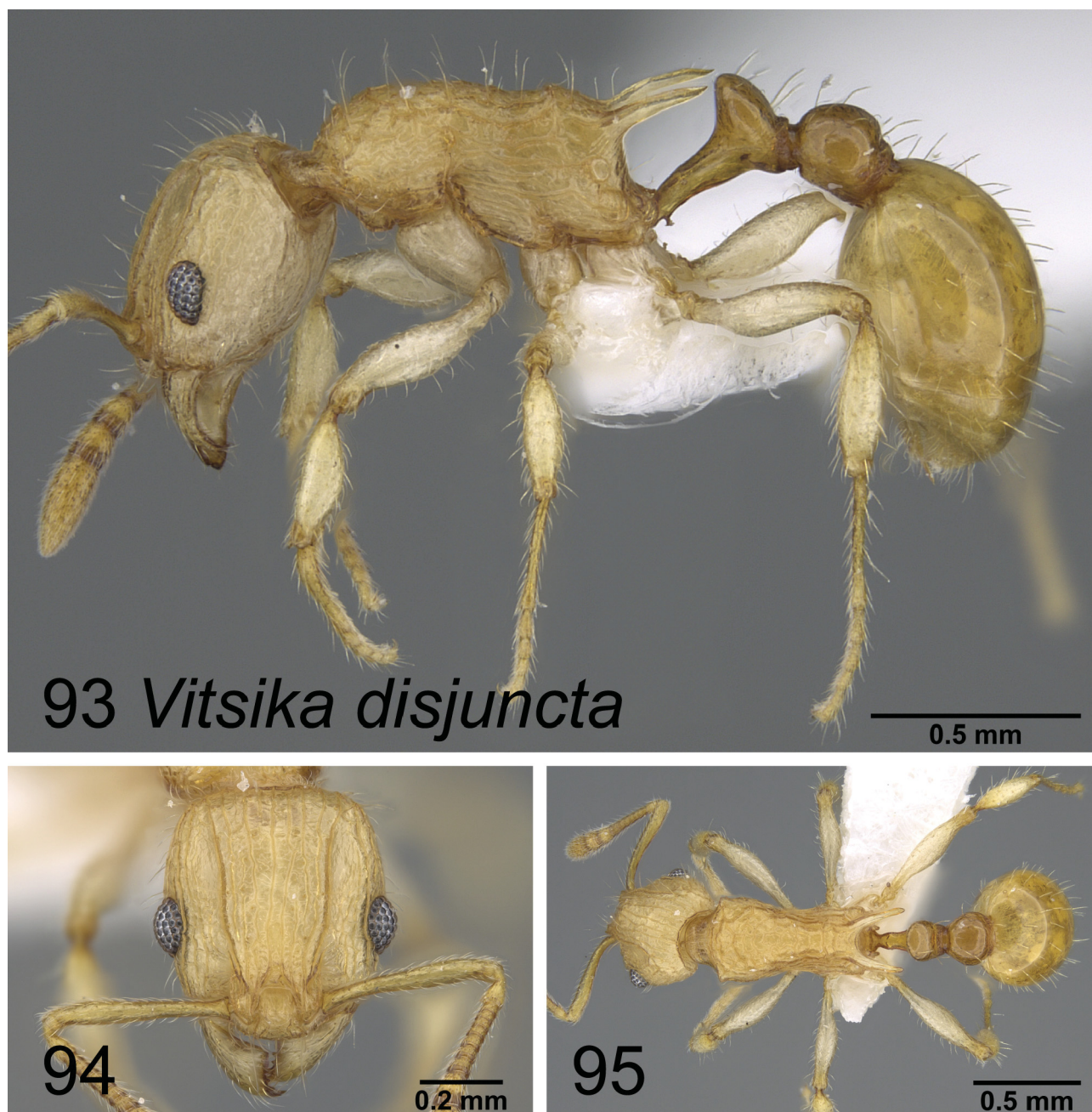
(Figs 93–95, Map 153)

WORKER (holotype in parentheses). TL 2.5–3.1 (2.9), HL 0.56–0.65 (0.62), HW 0.48–0.55 (0.53), CI 84–86 (85), SL 0.40–0.46 (0.46), SI 83–88 (87), PW 0.36–0.44 (0.40), WL 0.70–0.84 (0.82) (8 measured).

Eye with 6–7 rows of ommatidia, and with 8–9 ommatidia in the longest row; EL 0.15–0.16 (EL/HW 0.29–0.31). MfL 0.48–0.58 (MfL/HW 1.00–1.05). In profile, the dorsal outline of the propodeum rises to a markedly raised peak or angle posterior to the site of the metanotal groove, then descends abruptly and steeply to the dorsal base of the propodeal spine. Propodeal spines in profile slender, slightly elevated, weakly curved. Diameter of annulus of propodeal spiracle is at least equal to the thickness of the propodeal spine at its midlength.



Petiole node in profile small, subcuneate, erect or slightly curved anteriorly with respect to the peduncle; very narrowly rounded dorsally, and entirely unsculptured. Anterior face of petiole node vertical or slightly concave to the anterodorsal angle; the dorsal and posterior faces form a single, even curve behind the angle. Height of petiole node in posterior view (from midpoint of the dorsal margin of the foramen to the apex)  $0.90\text{--}1.00 \times$  its maximum width. In dorsal view postpetiole  $1.14\text{--}1.24 \times$  broader than long; maximum width of postpetiole  $0.92\text{--}1.00 \times$  the length of a propodeal spine; maximum width of postpetiole  $0.88\text{--}0.96 \times$  the distance between the apices of the propodeal spines. Length of postpetiole node in profile slightly less than the height of the segment. Disc of postpetiole entirely smooth, glossy. Full adult colour yellow.



FIGURES 93–95. Lateral, full face and dorsal view of body. *Vitsika disjuncta* holotype worker CASENT0248547.

QUEEN (gyne). Only a single alate known. HL 0.67, HW 0.59, CI 88, SL 0.47, SI 80, PW 0.52, WL 0.92, maximum width of mesoscutum 0.46, maximum length of mesoscutum 0.46, MfL 0.58. Propodeal spines long and slender, very slightly downcurved, almost horizontal.



MALE: unknown.

Holotype worker, **Madagascar**: Prov. Toamasina, F.C. Sandranantitra, 18°02.9'S, 49°05.5'E, 450 m., 18–21.i.1999, sifted litter (leaf mold, rotten wood), rainforest, #101(15)-5 (*H.J. Ratsirarson*) (CASC).

Paratypes. 3 workers on a single pin, with same data as holotype but #101(21); 3 workers on a single pin with same data but #101(21)-4 (CASC).

This species resembles *tenuis*, but in the vast majority of that species the propodeal spines are strongly downcurved, and the propodeal dorsum lacks the distinctive peak or crest that is present in *disjuncta*.

All material of this species was retrieved from litter samples.

**Non-paratypic material examined.** **Madagascar**: Prov. Toamasina, F.C. Sandranantitra (*H.J. Ratsirarson*); Prov. Toamasina, Betampona (*Fisher et al.*); Prov. Toamasina, Forêt Tampolo, Parcelle K9, NE Fenerive-Est (*Fisher et al.*); Prov. Toamasina, P.N. Mananara-Nord (*Fisher et al.*).



FIGURES 96–98. Lateral, full face and dorsal view of body. *Vitsika incisura* holotype worker CASENT0248544.



***Vitsika incisura* Bolton & Fisher sp. n.**

(Figs 96–98, Map 154)

WORKER (holotype in parentheses). TL 3.6–4.2 (4.0), HL 0.84–0.94 (0.93), HW 0.69–0.79 (0.78), CI 82–87 (84), SL 0.62–0.70 (0.68), SI 87–92 (87), PW 0.52–0.63 (0.63), WL 1.02–1.22 (1.20) (11 measured).

Eye with 8–9 rows of ommatidia, and with 9–11 ommatidia in the longest row; EL 0.18–0.22 (EL/HW 0.25–0.28). MfL 0.79–0.90 (MfL/HW 1.11–1.18). Oblique costulae on mesopleuron conspicuous. In profile, the dorsal outline of the propodeum is convex and slopes to the base of the spine. Diameter of annulus of propodeal spiracle is about equal to the thickness of the short propodeal spine at its midlength. With petiole node in posterior view its dorsal margin is impressed to deeply indented medially; at its maximum extent the indentation is so marked that the remainder of the margin forms a blunt projection on each side of the indentation. Height of petiole node in posterior view (from midpoint of the dorsal margin of the foramen to a line that spans the highest points of the node) 0.66–0.80 × its maximum width. In dorsal view postpetiole 1.30–1.50 × broader than long; maximum width of postpetiole 0.94–1.05 × the length of a propodeal spine; maximum width of postpetiole 0.85–1.00 × the distance between the apices of the propodeal spines. Disc of postpetiole entirely smooth. Full adult colour dark brown to blackish brown.

QUEEN (gyne). Only an ergatoid specimen known (CASENT0178899). HL 0.90, HW 0.74, CI 82, SL 0.66, SI 89, PW 0.60, WL 1.14, MfL 0.84. The ergatoid has three ocelli, but the mesosoma is almost worker-like. The mesonotum is slightly enlarged compared to the worker, and the track of the promesonotal suture is visible. As in the worker the dorsal margin of the petiole node is broadly excavated medially.

MALE: unknown.

Holotype worker, **Madagascar**: Prov. Antsiranana, R.S. Manongarivo, 17.3 km. 218° SW Antanambao, 1580 m., 14°01.3'S, 48°25.1'E, 27.x.1998, beating low vegetation, montane rainforest, BLF 1972(18)-4 (no CASENT number) (*B.L. Fisher*) (CASC).

Paratypes. 4 workers with same data as holotype, but 2 workers BLF 1972(24)-5 (no CASENT number), 1 worker BLF 1972(20) CASENT0004212, 1 worker BLF 1972(21) CASENT0127743 (CASC).

This is the only known *Vitsika* species in which the dorsal margin of the petiole node is concave medially.

Specimens of *incisura* are all from montane rainforest, and were found in a dead twig above the ground, and by beating low vegetation

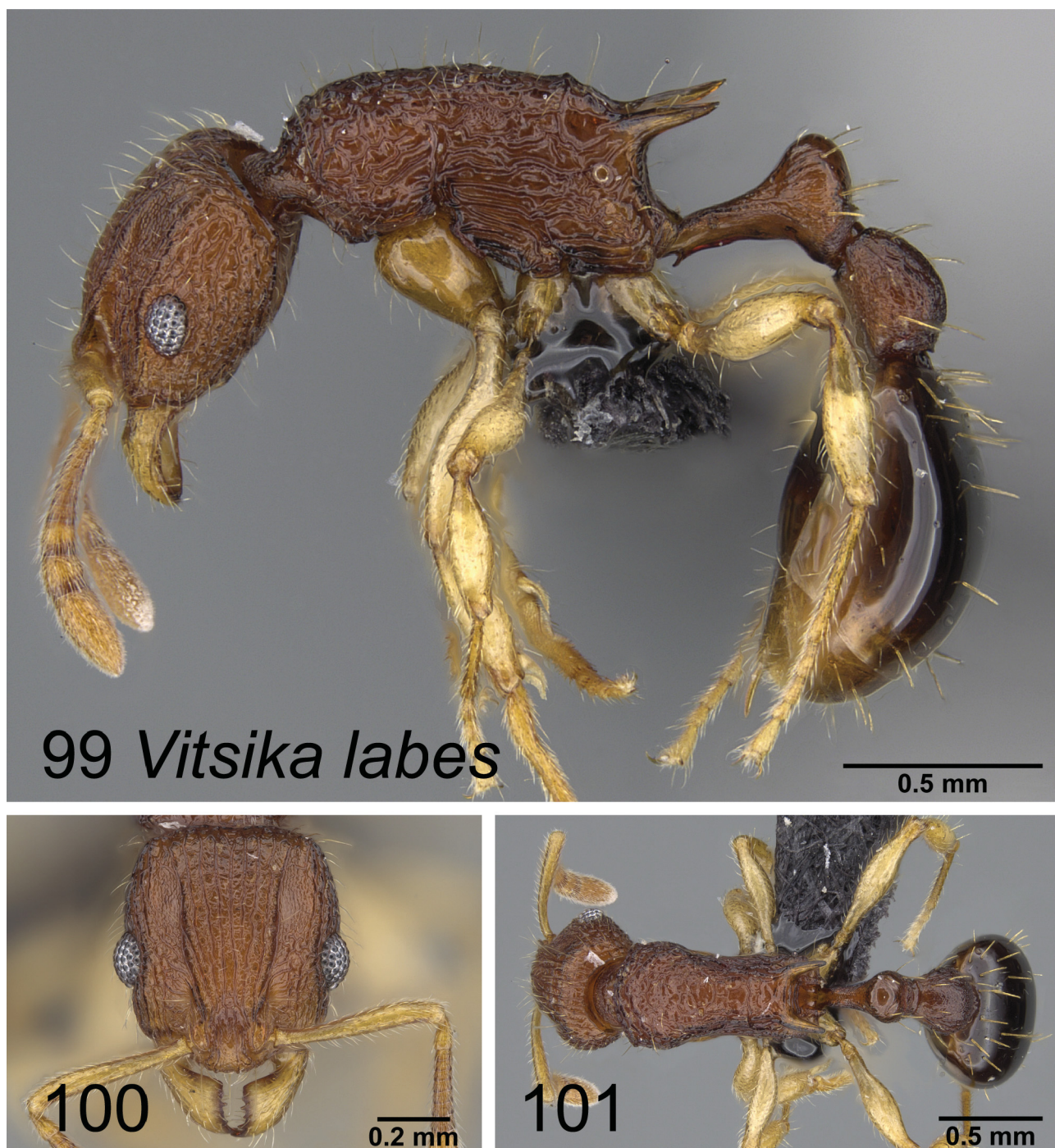
**Non-paratypic material examined.** **Madagascar**: Prov. Antsiranana, P.N. Marojejy, NNE Andapa (*Fisher et al.*); Prov. Antsiranana, R.S. Manongarivo, SW Antanambao (*B.L. Fisher*).

***Vitsika labes* Bolton & Fisher sp. n.**

(Figs 99–101, Map 155)

WORKER (holotype in parentheses). TL 3.1–3.7 (3.5), HL 0.68–0.77 (0.74), HW 0.56–0.66 (0.62), CI 82–88 (84), SL 0.48–0.54 (0.52), SI 80–86 (84), PW 0.46–0.56 (0.52), WL 0.88–1.04 (0.98) (12 measured).

Eye with 5–7 rows of ommatidia, and with 6–8 ommatidia in the longest row; EL 0.15–0.19 (EL/HW 0.26–0.29). MfL 0.60–0.72 (MfL/HW 1.03–1.10). In profile, propodeal dorsum with a distinct peak in its outline posterior to the mesonotal-propodeal junction, behind which the dorsum slopes steeply to the upper base of the spine. Propodeal spiracle small, diameter of annulus of spiracle is usually slightly less than the thickness of the propodeal spine at its midlength. Petiole node in profile bluntly rounded dorsally, with the anterior and posterior faces converging. Sculpture of petiole node weak to vestigial laterally, but the side never entirely smooth; posterior surface of petiole node with superficial sculpture, especially basally, but the sculpture fading out dorsally to leave the dorsum smooth. Height of petiole node in posterior view (from midpoint of the dorsal margin of the foramen to the apex) 0.92–1.07 × its maximum width. In dorsal view postpetiole 0.90–1.00 × broader than long; maximum width of postpetiole *ca* 1.04–1.23 × the length of a propodeal spine; maximum width of postpetiole 0.94–1.00 × the distance between the apices of the propodeal spines. Postpetiole node in profile relatively long and low, its dorsum shallowly convex; the length of the node in profile visibly greater than the height of the segment. Dorsum of postpetiole node superficially reticulate-punctulate, sometimes the sculpture effaced centrally on the disc. Full adult colour reddish brown to dark brown.



**FIGURES 99–101.** Lateral, full face and dorsal view of body. *Vitsika labes* holotype worker CASENT005639.

**QUEEN** (gyne). Putative ergatoid only known. HL 0.76, HW 0.66, CI 87, SL 0.54, SI 82, PW 0.55, WL 1.08, MfL 0.69 (1 measured). Ocelli absent. Mesosoma worker-like, without trace of wing insertions but with the mesonotum slightly larger than in the worker. Mesopleuron without a transverse sulcus. The identity of the specimen as an ergatoid is based only on the somewhat enlarged mesonotum.

**MALE.** HL 0.58, HW 0.47, CI 81, SL 0.19, SI 40, mesoscutum width at maximum 0.50, WL 1.04, EL 0.28, MfL 0.78 (1 measured). Propodeal dorsum weakly and superficially reticulate-punctulate; dorsum with a weak and slender median carina that also extends down the dorsal half of the declivity. Propodeum unarmed, the dorsum in profile rounds smoothly and evenly into the declivity. Petiole node in profile almost suppressed, long and very low, the node much longer than the petiole is high. Postpetiole in dorsal view much longer than broad, and in profile much longer than high. Colour brown.



Holotype worker, **Madagascar**: Prov. Toamasina, Ambanizana, P.N. Masoala, 15°34'18"S, 050°00'21.7"E, 900–950 m., 26.ii.–6.iii.2003, sifted litter (leaf mold, rotten wood), montane rainforest, BLF 8651, CASENT0056395 (*D. Silva et al.*) (CASC).

Paratypes. 5 workers, 1 ergatoid queen and 1 male, with same data as holotype but CASENT numbers 0056372, 006880, 006882, 006886, 006887, 0056373 (ergatoid), 0056378 (male) (CASC).

*V. labes* shares its long, low postpetiolar profile only with *venustas*, but the latter is a smaller species that is yellow in colour; see notes there.

The specimens of *labes* were all collected in montane rainforest, in a rotten log, and from litter samples and pitfall traps.

**Non-paratypic material examined.** **Madagascar**: Prov. Toamasina, Ambanizana, P.N. Masoala (*D. Silva et al.*); Prov. Toamasina, NE Ambanizana (*B.L. Fisher*).

### ***Vitsika manifesta* Bolton & Fisher sp. n.**

(Figs 102–104, Map 156)

WORKER (holotype in parentheses). TL 3.3–4.1 (4.0), HL 0.72–0.90 (0.84), HW 0.62–0.76 (0.72), CI 83–88 (86), SL 0.56–0.68 (0.62), SI 80–90 (86), PW 0.48–0.62 (0.58), WL 0.92–1.18 (1.04) (15 measured).

Eye with 5–8 rows of ommatidia, and with 6–10 ommatidia in the longest row; EL 0.15–0.20 (EL/HW 0.23–0.28). MfL 0.68–0.88 (MfL/HW 1.21–1.32). Oblique costulae on mesopleuron conspicuous. Diameter of annulus of propodeal spiracle is usually slightly greater than the thickness of the propodeal spine at its midlength. Propodeal declivity transversely costulate. In posterior view the petiole node tall and slender, its dorsal margin rising to a narrowly rounded median peak. Height of petiole node in posterior view (from midpoint of the dorsal margin of the foramen to the highest point of the node) 1.10–1.23 × its maximum width. In dorsal view postpetiole 1.07–1.15 × broader than long; maximum width of postpetiole 1.00–1.10 × the length of a propodeal spine; maximum width of postpetiole 0.90–1.04 × the distance between the apices of the propodeal spines. Side of petiole node usually, but not always, with longitudinal costulae; when present the costulae tend to overlap onto the posterior surface of the node, at least posterolaterally. Length of postpetiole node less than the height of the segment. Disc of postpetiole mostly smooth, but longitudinal costulae are usually visible laterodorsally. Full adult colour rich reddish brown to dark brown.

QUEEN (gyne). Ergatoid (*e.g.* CASENT0914197), alate, and intermediate (*e.g.* CASENT0914198) forms are known. Ergatoid: HL 0.86, HW 0.75, CI 87, SL 0.64, SI 85, PW 0.55, WL 1.12, MfL 0.84. The ergatoid has three ocelli. The mesosoma is almost worker-like except that the mesonotum is slightly enlarged compared to the worker. The mesopleural sulcus is absent. Intermediate: HL 0.84, HW 0.74, CI 88, SL 0.60, SI 81, PW 0.56, maximum length of mesoscutum 0.40, maximum width of mesoscutum 0.40, WL 1.08, MfL 0.78. Three ocelli present. Mesosoma with a full complement of flight sclerites, but the individual sclerites small, considerably reduced from size seen in alate queen, and without trace of wing articulations. Mesopleuron with a transverse sulcus. Alate: HL 0.87, HW 0.79, CI 91, SL 0.64, SI 81, PW 0.68, maximum length of mesoscutum 0.70, maximum width of mesoscutum 0.68, WL 1.30, MfL 0.86. Three ocelli present. Mesosoma with a full complement of full-sized flight sclerites, with wing articulation present. Mesopleuron with a broad transverse sulcus. Note that in all forms most measurements are within the worker range, but in the fully alate form PW and WL are greatly increased. Also, the mesoscutum is much larger in the alate than in the intermediate.

MALE: unknown.

Holotype worker, **Madagascar**: Prov. Antsiranana, P.N. Marojejy, 25.7 km. 32° NNE Andapa, 21–23.xi.2003, 1575 m., 14°26.7'S, 49°44.5'E, sifted litter, montane rainforest, BLF 9242(9), CASENT0040789 (*Fisher et al.*) (CASC).

Paratypes. 7 workers with same data as holotype, and all BLF 9242; (L0) CASENT0040797, (4) CASENT0040784, (6) CASENT0040790, (10) CASENT0040791, (13) CASENT0040792, (16) CASENT0040793, (22) CASENT0040795 (CASC, BMNH).

As seen in posterior view, the high, narrow petiole node, whose dorsal margin rises to a narrowly rounded median peak, is immediately diagnostic of *manifesta*. The height of the node in posterior view (from midpoint of the dorsal margin of the foramen to the highest point of the node) is 1.10–1.23 × its maximum width; *i.e.* the node

is always higher than wide. In all other species of *Vitsika*, with the node in posterior view the dorsal margin is always flat to broadly, shallowly convex (concave in *incisura*). In the remainder of the genus the total range of height of node is  $0.66\text{--}1.10 \times$  its maximum width. Only *labes* has an upper value of 1.10, but here the postpetiole node in profile is distinctly longer than the height of the segment.

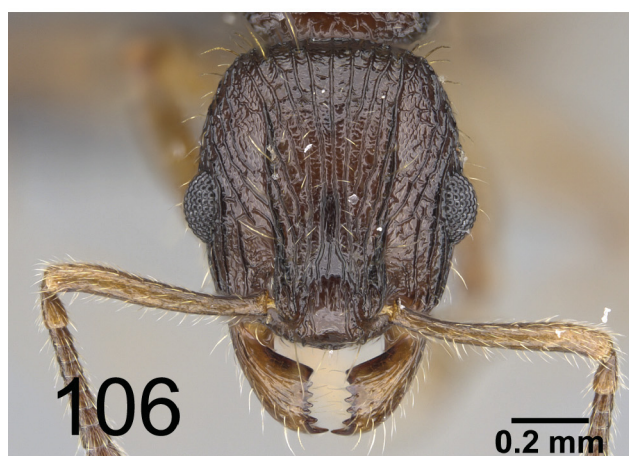


**FIGURES 102–104.** Lateral, full face and dorsal view of body. *Vitsika manifesta* holotype worker CASENT0040789.

All material of *manifesta* is from montane shrubland and rainforest, at considerable altitude (1565–2000 m.). Specimens have been retrieved from litter samples and yellow pan traps.

**Non-paratypic material examined.** **Madagascar:** Prov. Antsiranana, P.N. Marojejy, NNE Andapa (*Fisher et al.*); Prov. Antsiranana, RNI Marojejy, NW Manantenina (*E.L. Quinter*); Prov. Antsiranana, WSW Befingotra, Res. Anjanaharibe-Sud (*B.L. Fisher*).





FIGURES 105–107. Lateral, full face and dorsal view of body. *Vitsika miranda* holotype worker CASENT0147524.

***Vitsika miranda* Bolton & Fisher sp. n.**  
(Figs 105–107, Map 157)

WORKER (holotype in parentheses). TL 3.5–4.0 (3.7), HL 0.74–0.84 (0.83), HW 0.62–0.73 (0.70), CI 84–87 (84), SL 0.54–0.63 (0.62), SI 85–89 (89), PW 0.47–0.56 (0.54), WL 0.94–1.08 (1.06) (7 measured).

Eye with 8–9 rows of ommatidia, and with 9–11 ommatidia in the longest row; EL 0.17–0.22 (EL/HW 0.27–0.30). MfL 0.68–0.78 (MfL/HW 1.06–1.09). Antennal scape about the same shade as the head capsule, or at most only fractionally lighter. In profile, the dorsal outline of the propodeum shallowly convex to the upper base of the propodeal spine, without a distinct peak in its outline posterior to the mesonotal-propodeal junction. Propodeal declivity with distinct transverse costulae. Diameter of annulus of propodeal spiracle equal to, or only slightly less

than, the thickness of the propodeal spine at its midlength. Petiole node in profile highest at the anterodorsal angle and usually with a poorly defined, short, dorsal surface that rounds evenly into the posterior face. In posterior view the dorsal margin of the petiole node evenly, shallowly convex, or may be almost flat medially. Sculpture of petiole node weak to vestigial laterally; posterior surface of petiole node mostly smooth, but with a narrow punctulate band immediately above the foramen. Height of petiole node in posterior view (from midpoint of the dorsal margin of the foramen to the apex)  $0.85\text{--}0.92 \times$  its maximum width. In dorsal view postpetiole  $1.23\text{--}1.31 \times$  broader than long; maximum width of postpetiole *ca*  $1.00\text{--}1.15 \times$  the length of a propodeal spine; maximum width of postpetiole  $0.96\text{--}1.06 \times$  the distance between the apices of the propodeal spines. Postpetiole node in profile relatively short and high, its dorsum distinctly convex; the length of the node in profile is visibly greater than the height of the segment. Dorsum of postpetiole node usually entirely smooth, but vestigial remnants of superficial punctulae sometimes remain. The main suberect setae on the dorsal (outer) surface of the metatibia are all about the same length, and are distinctly shorter than the maximum tibial width. Full adult colour blackish brown to almost black.

QUEEN (gyne). Only alates known. HL  $0.89\text{--}0.90$ , HW  $0.75\text{--}0.79$ , CI  $84\text{--}88$ , SL  $0.63\text{--}0.65$ , SI  $82\text{--}84$ , PW  $0.65\text{--}0.68$ , mesoscutum maximum length  $0.60$ , mesoscutum maximum width  $0.60\text{--}0.62$ , WL  $1.24\text{--}1.28$ , MfL  $0.80\text{--}0.82$  (2 measured). Ocelli conspicuous. Mesosoma normal for alates, with a full complement of flight sclerites, wing articulation present, and mesopleuron with a transverse sulcus.

MALE: unknown.

Holotype worker, **Madagascar**: R.S. Kalambatritra [Prov. Toliara], Betanana, 08.ii.2002,  $23.4144^{\circ}\text{S}$ ,  $46.4590^{\circ}\text{E}$ , 1360 m., montane rainforest, BLF 21480, CASENT0147524 (*B.L. Fisher et al.*) (CASC).

Paratypes. 1 worker with same data as holotype but BLF 21466, CASENT0148648; 1 worker R.S. Kalambatritra, Ampanihy, 1270 m.,  $23.4635^{\circ}\text{S}$ ,  $46.4631^{\circ}\text{E}$ , 10.ii.2009, montane rainforest, BLF 21743, CASENT0147063 (*B.L. Fisher et al.*); 1 worker and 1 dealate queen, as last but 1269m.,  $23.46300^{\circ}\text{S}$ ,  $46.47057^{\circ}\text{E}$ , 10.ii.2009, BLF 21665, CASENT0149989 (*B.L. Fisher et al.*) (CASC).

*V. miranda* is very closely related to *obscura* (see below), and both resemble the yellow *astuta*. However, *astuta* has long, fine, suberect setae on the dorsal (outer) surface of the metatibia, the longest of which are almost as long as the maximum tibial width, and lacks, or at most has only vestiges of, transverse costulae on the propodeal declivity. By contrast, the suberect setae in both *miranda* and *obscura* are stubby and distinctly shorter than the maximum tibial width, and the transverse costulae of the propodeal declivity are conspicuous.

From the material available this species appears to be mostly found above ground level. Specimens have been found on low vegetation, in a dead bamboo stem, in a dead twig above the ground, and in a rotted pocket on a standing tree. A single worker has been retrieved from a pitfall trap, and an alate queen was found walking on the ground.

**Non-paratypic material examined.** **Madagascar**: Prov. Toliara, R.S. Kalambatritra, Ampanihy (*B.L. Fisher et al.*); Prov. Toliara, P.N. Andohahela, ESE Mahamavo (*Fisher et al.*); Prov. Fianarantsoa, P.N. Befotaka-Midongy (*Fisher et al.*).

### ***Vitsika obscura* Bolton & Fisher sp. n.**

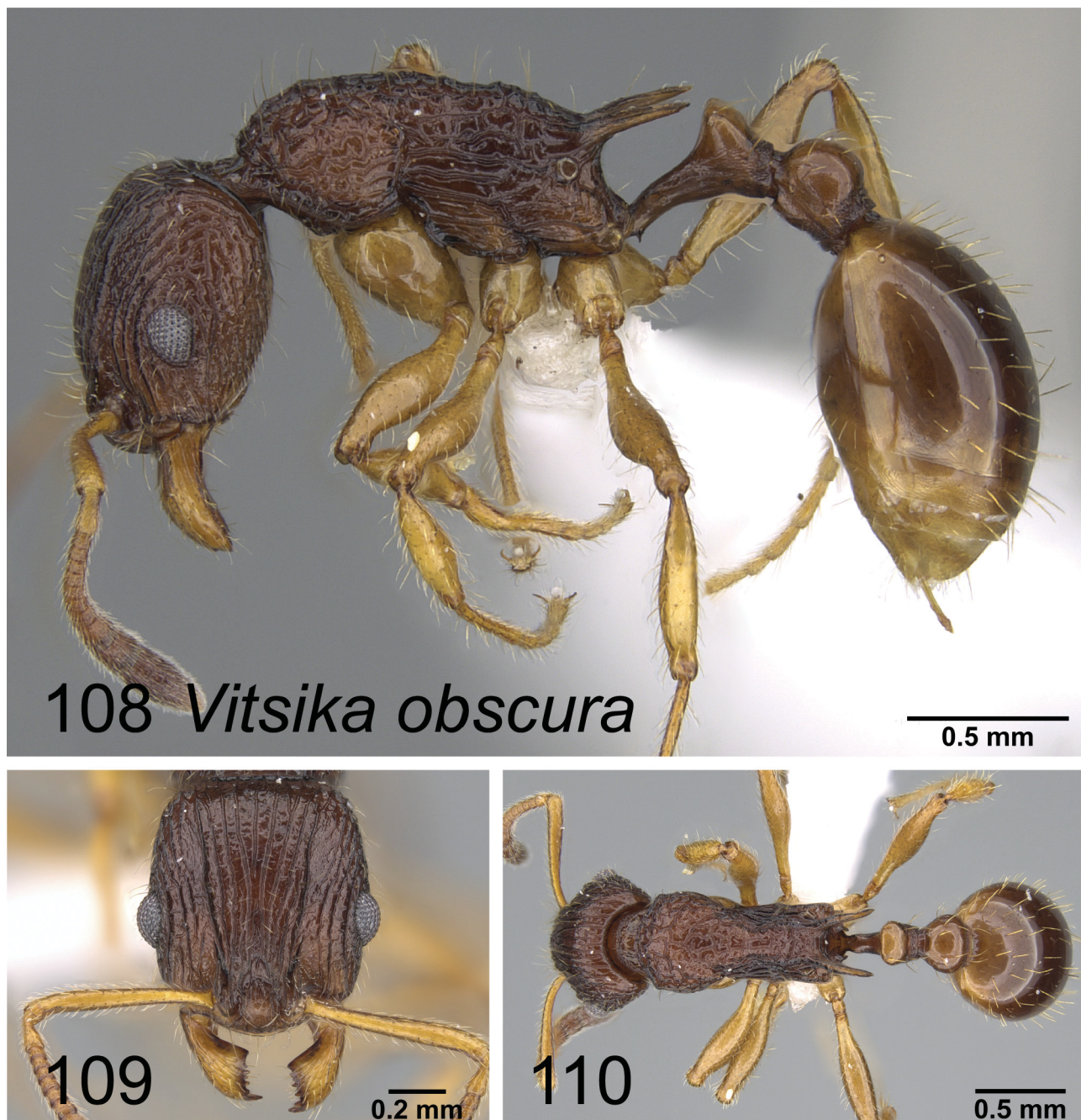
(Figs 108–110, Map 158)

WORKER (holotype in parentheses). TL  $4.1$  ( $4.1$ ), HL  $0.91\text{--}0.92$  ( $0.91$ ), HW  $0.75\text{--}0.78$  ( $0.75$ ), CI  $82\text{--}85$  ( $82$ ), SL  $0.68\text{--}0.69$  ( $0.69$ ), SI  $88\text{--}92$  ( $92$ ), PW  $0.59\text{--}0.61$  ( $0.59$ ), WL  $1.20\text{--}1.22$  ( $1.20$ ) (4 measured).

Eye with 9 rows of ommatidia, and with 10–11 ommatidia in the longest row; EL  $0.20\text{--}0.23$  (EL/HW  $0.27\text{--}0.29$ ). MfL  $0.86\text{--}0.88$  (MfL/HW  $1.11\text{--}1.16$ ). Antennal scape yellow, distinctly lighter in shade than the brown head capsule. In profile, the dorsal outline of the propodeum with a short, horizontal plateau immediately behind the mesonotal-propodeal junction that then slopes down to the upper base of the propodeal spine, without a distinct peak in its outline posterior to the mesonotal-propodeal junction. Propodeal declivity with 3–4 distinct transverse costulae. Diameter of annulus of propodeal spiracle about equal to the thickness of the propodeal spine at its midlength. Petiole node in profile highest at the anterodorsal angle, the short dorsal surface grades imperceptibly into the posterior face. In posterior view the dorsal margin of the petiole node evenly shallowly convex, or almost flat medially. Sculpture of petiole node weak to vestigial laterally; posterior surface of petiole node mostly smooth, but with some sculptural remnants immediately above the foramen. Height of petiole node in



posterior view (from midpoint of the dorsal margin of the foramen to the apex)  $0.78\text{--}0.92 \times$  its maximum width. In dorsal view postpetiole  $1.25\text{--}1.36 \times$  broader than long; maximum width of postpetiole  $ca\ 0.95\text{--}1.06 \times$  the length of a propodeal spine; maximum width of postpetiole  $0.90\text{--}1.00 \times$  the distance between the apices of the propodeal spines. Postpetiole node in profile relatively short and high, its dorsum distinctly convex; the length of the node in profile is visibly greater than the height of the segment. Dorsum of postpetiole node smooth. The main suberect setae on the dorsal (outer) surface of the metatibia are all about the same length, and distinctly shorter than the maximum tibial width. Full adult colour brown to dark brown.



FIGURES 108–110. Lateral, full face and dorsal view of body. *Vitsika obscura* holotype worker CASENT0192019.

QUEEN (gyne) and MALE: unknown.

Holotype worker, **Madagascar**: 38 km. S Ambalavao [Prov. Fianarantsoa], Res. Andringitra,  $22^{\circ}12'S$ ,  $46^{\circ}58'E$ , 1680 m., 23.x.1993, sifted litter (leaf mold, rotten wood), montane rainforest, BLF 820(10)-3, CASENT0192019 (*B.L. Fisher*) (CASC).

Paratype. 1 worker with same data as holotype but BLF 820(16)-2, no CASENT number (CASC).

This species is described as separate from *miranda* with some reservations. Only four specimens of *obscura* are known, but they are consistently larger and lighter in colour than *miranda*, and have fewer but more widely spaced longitudinal costulae on the mesopleuron. Both *miranda* and *obscura* are similar to the yellow *astuta*, but in that species some of the suberect setae on the dorsal (outer) surface of the metatibia are long and fine, at least as long as the maximum tibial width. In *miranda* and *obscura* all suberect setae on the dorsal (outer) metatibial surface are distinctly shorter than the width of the metatibia, and have a uniform, stubby appearance.

*V. obscura* has been found in a litter sample and by beating low vegetation.

**Non-paratypic material examined. Madagascar:** Prov. Fianarantsoa, SSW Ambositra, Ankazomivady (*B.L. Fisher*).

### ***Vitsika procera* Bolton & Fisher sp. n.**

(Figs 111–113, Map 159)

WORKER (holotype in parentheses). TL 3.0–3.4 (3.0), HL 0.67–0.76 (0.67), HW 0.54–0.64 (0.55), CI 81–84 (82), SL 0.47–0.56 (0.48), SI 83–89 (87), PW 0.41–0.51 (0.41), WL 0.86–0.98 (0.86) (12 measured).

Eye with 7–8 rows of ommatidia, and with 9–10 ommatidia in the longest row; EL 0.16–0.19 (EL/HW 0.29–0.31). MfL 0.56–0.70 (MfL/HW 1.00–1.10). Diameter of annulus of propodeal spiracle usually greater than the thickness of the propodeal spine at its midlength. Petiole node in profile more or less erect with respect to the peduncle, the node not obviously inclined posteriorly; node often with a defined posterior surface that is differentiated from the oblique dorsum, but in some the dorsum rounded. Sculpture of petiole node conspicuous: in profile with distinct costulae or rugulae that ascend the anterior surface, traverse the sides near the dorsum, and usually overlap onto the posterior surface; in some specimens the costulae extend across the posterior surface. Height of petiole node in posterior view (from midpoint of the dorsal margin of the foramen to the apex) 0.86–1.00  $\times$  its maximum width. In dorsal view postpetiole 1.10–1.18  $\times$  broader than long; maximum width of postpetiole  $< 1.20 \times$  the length of a propodeal spine; maximum width of postpetiole 0.93–1.07  $\times$  the distance between the apices of the propodeal spines. Length of postpetiole node in profile about equal to the height of the segment. Dorsum of postpetiole with weak punctulate sculpture over most or all of the surface, and laterodorsally with longitudinal costulae visible. Full adult colour yellow.

QUEEN (gyne). Ergatoid only known (*e.g.* CASENT0192035). The single ergatoid specimen available is almost exactly like the worker, but retains a small median ocellus, and is larger than most workers, HL 0.77, HW 0.64, CI 83, SL 0.54, PW 0.49, WL 1.00, MfL 0.68 (1 measured). The relative dimensions of the eye, petiole, and postpetiole are as in the worker. It is possible that the two largest individuals regarded as workers here (HL 0.74–0.76, HW 0.60–0.64, MfL 0.66–0.70) may in fact be ergatoids in which the ocelli are wholly suppressed. MfL in these two specimens is decidedly above the range shown otherwise, which is MfL 0.55–0.58. If so, this would parallel the situation seen in *Eutetramorium mocquersyi*, where the ergatoid can only be distinguished from the worker by dissection of the reproductive system.

MALE: unknown.

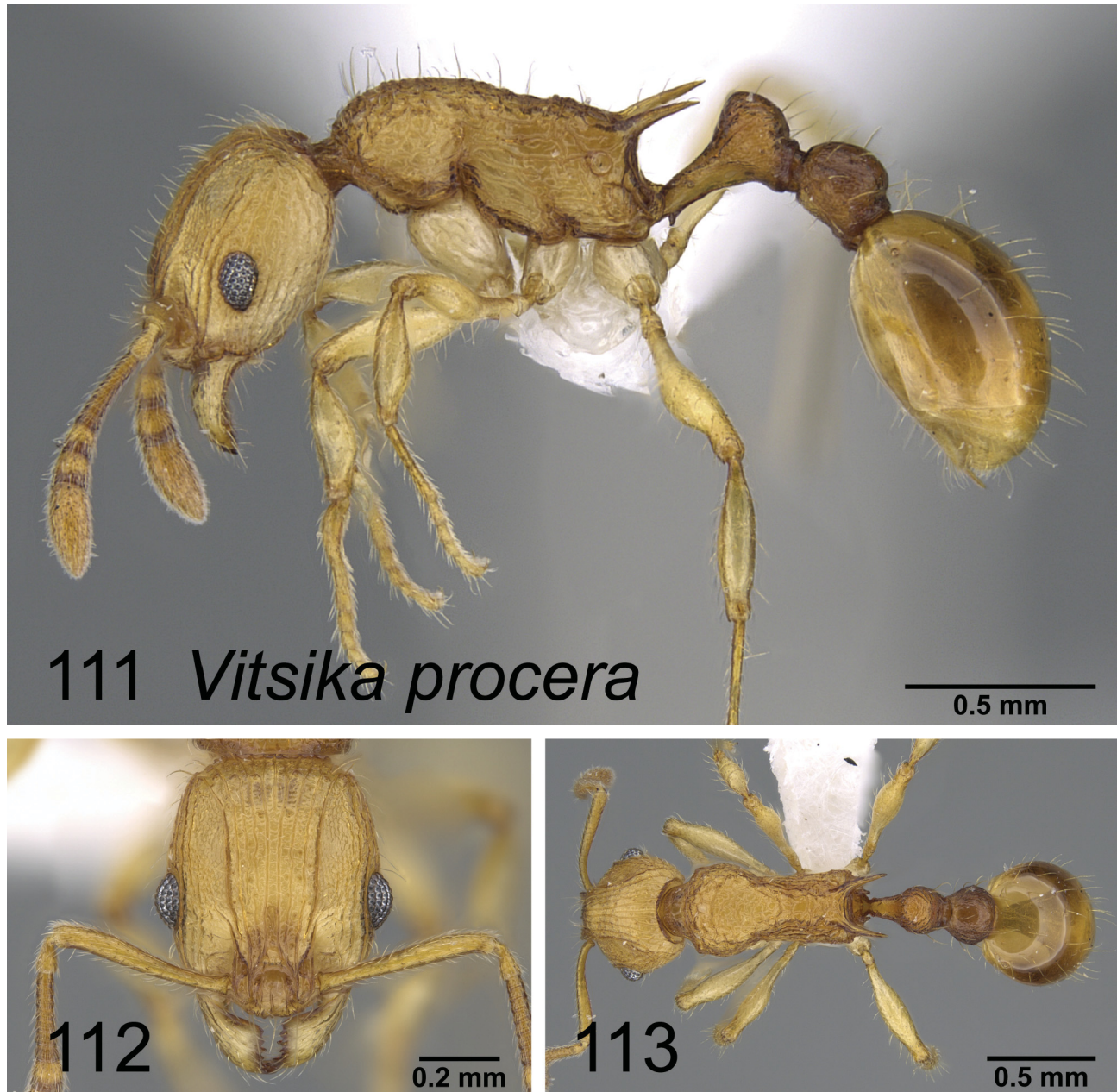
Holotype worker (top specimen of 3 on pin), **Madagascar:** Prov. Toamasina, P.N. Mantadia, 895 m., 18°47.5'S, 48°25.6'E, 25–28.xi.1998, sifted litter (leaf mold, rotten wood), rainforest, 111(8)-4, CASENT0127747 (*H.J. Ratsirarson*) (CASC).

Paratypes. 2 workers mounted on same pin, below the holotype; 3 workers on one pin, with same data but #111(20)-6, CASENT0192030; 1 worker with same data but #111(5)-4, without a CASENT number (CASC).

Very similar to *suspicalis*, but most samples of *procera* are distinguished by having a thicker, less gracile petiole node, which tends to be narrower, has a more narrowly convex dorsal margin in posterior view, and has conspicuous costulate to rugulose sculpture anteriorly, laterally, and usually also posteriorly. The shape of the petiole node in profile shows some variation, the significance of which is not immediately apparent. In some specimens of *procera* the bluntly rounded anterodorsal angle of the node is the highest point in profile. The dorsal surface is only shallowly convex, and slopes downward posteriorly from the anterodorsal angle; the dorsum then meets a differentiated short posterior face through a blunt and rounded angle (*e.g.* *procera* type-series). However, in others the dorsum is shorter, distinctly more strongly convex, and rounds much more broadly into the posterior face, to such an extent that in some the two faces are not differentiated. The significance of this variation cannot be



estimated at present, but two possibilities present themselves: first, that more than one sibling species currently resides under the name *procera*; second, that *procera* specimens are really nothing more than isolated strongly sculptured examples of *suspica*. Nest series of a decent size, of both nominal forms, will be necessary before these alternatives can be resolved.



**FIGURES 111–113.** Lateral, full face and dorsal view of body. *Vitsika procera* holotype worker CASENT0914140.

All material was retrieved from litter samples in rainforest, except for a single worker, which was acquired by beating low vegetation in rainforest.

**Non-paratypic material examined. Madagascar:** Prov. Toamasina, Mont. Anjanaharibe, NNE Ambinanitelo (Fisher et al.); Prov. Toamasina, WSW Befingotra, Res. Anjanaharibe-Sud (*B.L. Fisher*); Prov. Toamasina, Ambanizana, P.N. Masoala (*D. Silva et al.*); Prov. Toamasina, NE Ambanizana (*B.L. Fisher*); Prov. Toliara, NW Enakara, Rés. Andohahela (*B.L. Fisher*).

***Vitsika suspicax* Bolton & Fisher sp. n.**

(Figs 114–116, Map 160)

WORKER (holotype in parentheses). TL 3.0–3.4 (3.3), HL 0.66–0.72 (0.72), HW 0.53–0.60 (0.56), CI 79–83 (79), SL 0.46–0.52 (0.47), SI 82–89 (84), PW 0.41–0.48 (0.44), WL 0.84–0.94 (0.90) (12 measured).

Eye with 7–8 rows of ommatidia, and with 9–10 ommatidia in the longest row; EL 0.16–0.19 (EL/HW 0.29–0.32). MfL 0.54–0.64 (MfL/HW 0.98–1.08). Diameter of annulus of propodeal spiracle equal to or greater than the thickness of the propodeal spine at its midlength. Petiole node in profile more or less erect with respect to the peduncle, the node not obviously inclined posteriorly; node usually without a defined posterior surface that is distinctly differentiated from the dorsum. In general the ascending anterior face of the node terminates in a blunted anterodorsal angle, which is the highest point of the node. Behind this the dorsum slopes downward posteriorly and rounds broadly and evenly into the sloping posterior face. In some specimens the two surfaces meet through a more obvious rounded angle. Sculpture of petiole node faint to vestigial: in some specimens the node with faint superficial microsculpture only; in others a few extremely weak and fine striae ascend the anterior surface, but when these occur they never traverse the sides near the dorsum, nor overlap onto the posterior surface. Height of petiole node in posterior view (from midpoint of the dorsal margin of the foramen to the apex)  $0.87\text{--}0.96 \times$  its maximum width. In dorsal view postpetiole  $1.08\text{--}1.20 \times$  broader than long; maximum width of postpetiole  $< 1.20 \times$  the length of a propodeal spine; maximum width of postpetiole  $0.93\text{--}1.00 \times$  the distance between the apices of the propodeal spines. Length of postpetiole node in profile about equal to the height of the segment. Dorsum of postpetiole usually entirely smooth on the disc; weak punctulate sculpture is usually present posteriorly and laterodorsally, and weak laterodorsal longitudinal costulae are sometimes present. Full adult colour yellow.

QUEEN (gyne). May be ergatoid (*e.g.* CASENT0914211), alate, or intermediate between the two (*e.g.* CASENT0914196). Two extreme ergatoid specimens are known; one lacks ocelli and the other has a small median ocellus present. In both, the mesonotum is somewhat more swollen than in the worker, and the mesopleuron lacks a transverse sulcus. Both are about equal in size to the largest specimen currently regarded as a worker, HL 0.73–0.74, HW 0.58–0.59, CI 78–81, SL 0.52–0.53, SI 90, PW 0.45–0.46, WL 0.96, MfL 0.62 (2 measured). Two intermediate specimens (one with gaster missing) are known; both have three distinct ocelli, and a distinct transverse sulcus on the mesopleuron. The mesosoma is almost worker-like but is larger and has weakly differentiated flight sclerites, a fused mesoscutum plus mesoscutellum instead of a simple mesonotum, and the metanotum is vestigially present. In dorsal view the pronotum is fused to the mesoscutum, separated from it only by an impression, there is no suture, and the reduced mesoscutum and mesoscutellum are fused; there are no traces of wings. Dimensions of the intermediate forms fall broadly within the worker range: HL 0.69–0.70, HW 0.58, CI 83–84, SL 0.47–0.48, SI 81–83, PW 0.44–0.54, WL 0.88, MfL 0.57–0.58 (1 measured). Four dealate queens are known, three of which are included in the type-series. These possess a swollen mesosoma with a full complement of flight sclerites, have 3 distinct ocelli, and have a conspicuous transverse sulcus on the mesopleuron. Cephalic dimensions of these specimens are only slightly larger than in the workers, but the mesosoma is more voluminous: HL 0.73–0.75, HW 0.60–0.61, CI 81–84, SL 0.52–0.53, SI 85–87, PW 0.53–0.56, WL 1.02–1.10, maximum width of mesoscutum 0.48–0.52, maximum length of mesoscutum 0.55–0.56, MfL 0.65–0.67 (3 measured).

MALE: unknown.

Holotype worker, **Madagascar**: Prov. Antsiranana, P.N. Marojejy, 25.7 km. 32° NNE Andapa, 21–23.xi.2003, 1575 m., 14°26.7'S, 49°44.5'E, sifted litter, montane rainforest, BLF 9242(L0), CASENT0040798 (*Fisher et al.*) (CASC).

Paratypes. 2 workers and 3 dealate queens, with same data as holotype: workers, BLF 9242(4), CASENT0040785; BLF 9242(9), CASENT0040788; queens, BLF 9242(L0), CASENT0040796; BLF 9242(2), CASENT0040783; BLF 9242(21), CASENT0040794 (CASC). [Note that two workers, with same data as holotype but BLF 9242(8), CASENT0040786 (head missing) and CASENT0040787 (head, waist segments and gaster missing), are omitted from the type-series as they are badly damaged.]

Separated only weakly from *procera* by the form and sculpture of the petiole node, which in *suspacax* is more slender and generally less angular in profile, with a broader and more shallowly convex dorsal margin in posterior view, and always more feebly and superficially sculptured. As mentioned under *procera*, it may transpire that *suspacax* and *procera* are respectively less and more strongly sculptured variants of a single species. A single worker from Ankarana (CASENT0275352), may represent a very closely related but separate species. This



specimen is at the top end of the size range given above (HL 0.72, HW 0.60, SL 0.52, MfL 0.64), but has a higher and more slender petiole node than is usual, more strongly developed rugose sculpture on the mesosoma, and a metanotal groove that in profile is broader and more obviously concave. We consider this specimen as *suspica* until more material indicates otherwise.



FIGURES 114–116. Lateral, full face and dorsal view of body. *Vitsika suspicax* holotype worker CASENT0040798.

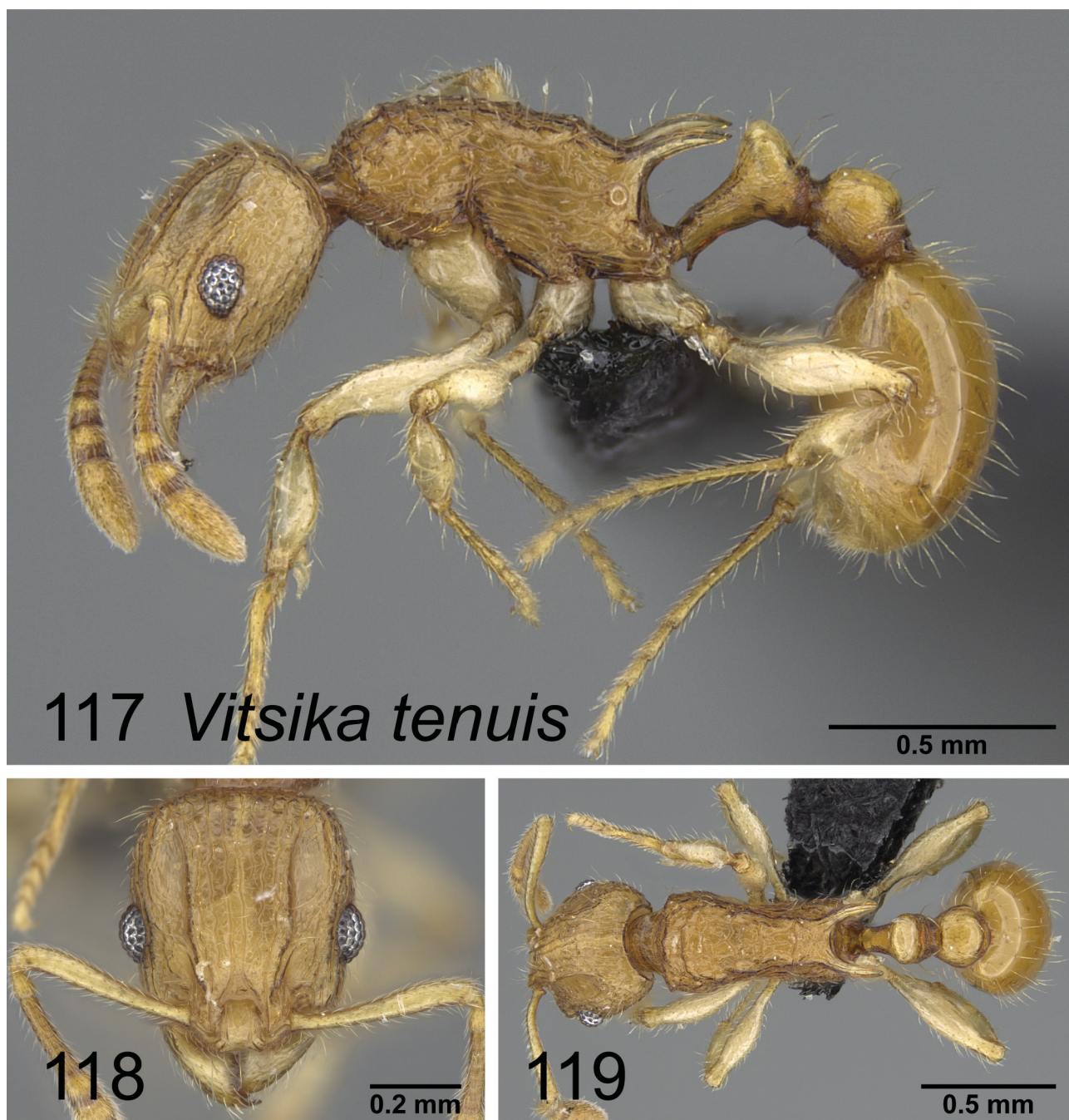
All material was retrieved from litter samples or from yellow pan traps, in montane rainforest.

**Non-paratypic material examined.** **Madagascar:** Prov. Antsiranana, P.N. Marojejy (*Fisher et al.*); Prov. Antsiranana, P.N. Marojejy, NNE Andapa (*Fisher et al.*); Prov. Antsiranana, RNI Marojejy, NW Manantenina (*E.L. Quinter*); Prov. Toamasina, WSW Befingotra, Res. Anjanaharibe-Sud (*B.L. Fisher*); Prov. Toamasina, Ankerana (*B.L. Fisher et al.*);

***Vitsika tenuis* Bolton & Fisher sp. n.**  
(Figs 117–119, Map 161)

WORKER (holotype in parentheses). TL 2.2–2.8 (2.7), HL 0.54–0.62 (0.61), HW 0.46–0.52 (0.50), CI 81–86 (82), SL 0.38–0.44 (0.44), SI 80–88 (88), PW 0.34–0.39 (0.39), WL 0.62–0.74 (0.74) (15 measured).





**FIGURES 117–119.** Lateral, full face and dorsal view of body. *Vitsika tenuis* holotype worker CASENT0464860.

Eye with 5–6 rows of ommatidia, and with 6–7 ommatidia in the longest row; EL 0.13–0.14 (EL/HW 0.28–0.30). MfL 0.45–0.52 (MfL/HW 0.98–1.00). Dorsal outline of propodeum in profile, from approximate site of metanotal groove to dorsal base of spine, evenly curved or at most with a very low, obtuse angle anteriorly. Propodeal spines in profile usually distinctly downcurved along their length. Degree of curvature of the spines is variable: in most it is striking but in a few it is not as pronounced, and in the very smallest workers it may not be apparent. Diameter of annulus of propodeal spiracle is about equal to the thickness of the propodeal spine at its midlength. Petiole node in profile small, more or less erect with respect to the peduncle, the node not obviously inclined posteriorly; narrowly but bluntly rounded dorsally, and with the anterior and posterior faces converging toward the dorsum. Sculpture of petiole node faint to vestigial laterally, absent from posterior surface. Height of petiole node in posterior view (from midpoint of the dorsal margin of the foramen to the apex)  $0.86\text{--}0.95 \times$  its maximum width. In dorsal view postpetiole  $1.20\text{--}1.38 \times$  broader than long; maximum width of postpetiole  $0.93\text{--}1.15 \times$  the length of a propodeal spine; maximum width of postpetiole  $0.82\text{--}0.92 \times$  the distance between the



apices of the propodeal spines. Length of postpetiole node in profile slightly less than the height of the segment. Disc of postpetiole entirely smooth. Full adult colour yellow.

QUEEN (gyne). Only alates known. HL 0.63–0.66, HW 0.54–0.59, CI 86–89, SL 0.44–0.46, SI 79–82, PW 0.49–0.54, WL 0.90–0.96, maximum width of mesoscutum 0.43–0.50, maximum length of mesoscutum 0.44–0.52, MfL 0.54–0.60 (3 measured). Propodeal spines stouter and relatively a little shorter than in workers, but characteristically downcurved along their length.

MALE: unknown.

Holotype worker, **Madagascar**: Prov. Antsiranana, Ampasindava, Ambilanivy, 3.9 km. 181° S Ambaliha, 600 m., 13°48'S, 48°10'E, 4–9.iii.2001, sifted litter, rainforest, BLF 3252(33), CASENT0464860 (*Fisher et al.*) (CASC).

Paratypes. 5 workers and 3 dealate queens, all BLF 3252: workers (31) CASENT0464846, (32) CASENT0464854, two numbered (42) CASENT0484907 and CASENT0464909, and (45) CASENT0464926; queens (32) CASENT0464853, (43) CASENT0464916, and (47) CASENT0464934 (CASC). [The eight paratype specimens have been selected from leaf litter series BLF 3252, which also contains another 14 workers and 5 dealate queens, all in CASC.]

The vast majority of *tenuis* specimens are instantly recognisable by their strongly downcurved propodeal spines. Some other species have propodeal spines that in profile are shallowly curved or weakly sinuate, but none are downcurved to the extent seen in *tenuis*. In addition, *tenuis* is a small yellow species (HW 0.46–0.52), with relatively few ommatidia in the eye, without a marked peak or crest in the propodeal dorsal outline, with an upright petiole node that lacks strong sculpture, and with the disc of the postpetiole smooth.

All material of this species was retrieved from litter samples in rainforest.

**Non-paratypic material examined. Madagascar**: Prov. Antsiranana, Ampasindava, Ambilanivy (*Fisher et al.*); Prov. Antsiranana, R.S. Manongarivo, SW Antanambao (*B.L. Fisher*); Prov. Toamasina, R.S. Ambatovaky (*B.L. Fisher et al.*); Galoka chain, Mont Galoka (*B.L. Fisher et al.*).

### ***Vitsika venustas* Bolton & Fisher sp. n.**

(Figs 120–122, Map 162)

WORKER (holotype in parentheses). TL 2.5–3.1 (3.0), HL 0.56–0.66 (0.65), HW 0.48–0.56 (0.54), CI 81–86 (83), SL 0.40–0.48 (0.48), SI 84–91 (89), PW 0.39–0.46 (0.43), WL 0.70–0.89 (0.84) (20 measured).

Eye with 6–7 rows of ommatidia, and with 7–8 ommatidia in the longest row; EL 0.13–0.17 (EL/HW 0.28–0.30). MfL 0.49–0.60 (MfL/HW 1.02–1.07). Propodeal spiracle small, diameter of annulus of spiracle is usually less than the thickness of the propodeal spine at its midlength. Petiole node in profile more or less erect with respect to the peduncle, the node not obviously inclined posteriorly; node bluntly rounded dorsally, and the anterior and posterior faces converging dorsally. Sculpture of petiole node faint to vestigial laterally, but the side never entirely smooth; posterior surface of node usually with some weak, punctate sculpture on the lower half, but smooth on the upper half. Height of petiole node in posterior view (from midpoint of the dorsal margin of the foramen to the apex) 0.85–1.05 × its maximum width. In dorsal view postpetiole 1.00–1.15 × broader than long; maximum width of postpetiole 1.10–1.25 × the length of a propodeal spine; maximum width of postpetiole 0.90–1.00 × the distance between the apices of the propodeal spines. Postpetiole node in profile relatively long and low, its dorsum shallowly convex; the length of the node in profile visibly greater than the height of the segment. Dorsum of postpetiole never entirely smooth, although the disc may be so. More typically the dorsum with weak superficial punctulae over part or most of its surface, especially posteriorly and laterodorsally, a few weak longitudinal costulae often may also be discernible, especially laterodorsally. Full adult colour yellow to light brownish yellow.

QUEEN (gyne). Ergatoid (*e.g.* CASENT0102971) and alate forms are known. Ergatoid HL 0.68, HW 0.56, CI 82, SL 0.48, SI 86, PW 0.46, WL 0.90, MfL 0.58. (1 measured) Worker-like, without ocelli or traces of wing insertions, but with an enlarged mesonotum and a shallow promesonotal impression but no trace of a suture. Mesopleuron without a transverse sulcus. Alate HL 0.66–0.68, HW 0.56–0.58, CI 85, SL 0.46–0.49, SI 82–84, PW 0.50–0.54, WL 0.91–1.00, maximum width of mesoscutum 0.45–0.55, maximum length of mesoscutum 0.48–0.50, MfL 0.58–0.62 (3 measured). With 3 ocelli, a full complement of flight sclerites, and a distinct mesopleural

transverse sulcus. Like the workers, the queen also has a relatively small propodeal spiracle and a relatively long, low postpetiole.



**FIGURES 120–122.** Lateral, full face and dorsal view of body. *Vitsika venustas* holotype worker CASENT0045957.

MALE: unknown.

Holotype worker, **Madagascar**: Prov. Antsiranana, P.N. Marojejy, 28.0 km. 38° NE Andapa, 450 m., 14°26.2'S, 49°46.5'E, 12–15.xi.2003, sifted litter, rainforest, BLF 8722(9), CASENT0045957 (*Fisher et al.*) (CASC).

Paratypes. 14 workers, 1 ergatoid, and 2 dealate queens, all with same data as holotype and all BLF 8722: workers (L0) CASENT0046161 and 0046179, (3) CASENT0046165, (5) CASENT0045938, (6) CASENT0045942, (7) CASENT0046167, (8) CASENT0046168, (9) CASENT0046169, (12) CASENT0046171, (13) CASENT0046172, (17) CASENT0046174, (19) CASENT0045922, (21) CASENT0046175, (22) CASENT0046177; ergatoid (14) CASENT0046173; dealate queens (L0) CASENT0046178, (18) CASENT0046029 (CASC, BMNH).





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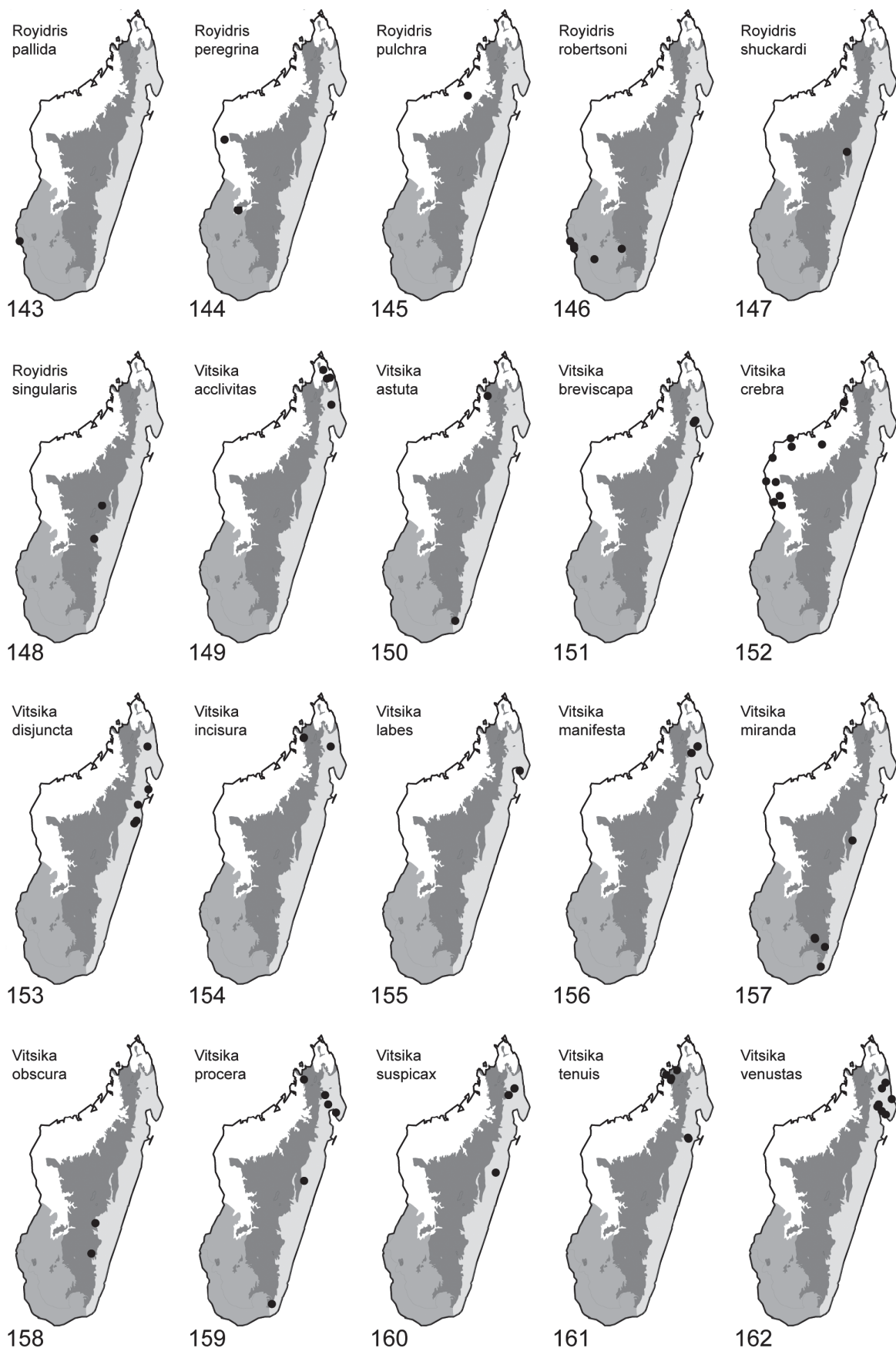
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**FIGURES 123–162.** Distribution maps of each species based on geographic coordinates of the specimens cited in this article. Species distributions are mapped over the outlines of four simplified ecoregion: eastern rainforest (light gray); central montane forest (dark gray); western dryforest (white); southwest desert spiny bush thicket (medium gray).



The relatively long, low postpetiole of *venustas* is also developed in *labes*, but the latter is a larger (HL 0.68–0.77, HW 0.56–0.66, SL 0.48–0.54, MfL 0.60–0.72), more darkly coloured species, in which the eyes tend to be somewhat smaller (EL/HW 0.26–0.29). In reality, the size ranges of the two form a rough continuum, with the upper limits for *venustas* constituting the lower limits for *labes*, which raises the possibility that *labes* is merely a larger morphotype of *venustas*. Contradicting this possibility is the fact that specimens of both forms have never been retrieved from a single sample, and some series of *venustas* are extensive. Consequently, the two are regarded as separate species here.

Most examples of *venustas* were retrieved from leaf litter samples in rainforest, but a few have been found in pitfall traps and yellow pan traps, and a colony was discovered in a dead twig on the ground.

**Non-paratypic material examined. Madagascar:** Prov. Antsiranana, P.N. Marojejy, NE Andapa (*Fisher et al.*); Prov. Toamasina, S. Ambanizana, Andranobe (*B.L. Fisher*); Prov. Toamasina, SSE Ambanizana, Andranobe (*B.L. Fisher*); Prov. Toamasina, Mont. Anjanaharibe, NNE Ambinanitelo (*Fisher et al.*); Prov. Toamasina, Anjanaharibe (*Jackson & Carpenter*); Prov. Toamasina, Mont. Akirindro, NNW Ambinanitelo (*Fisher et al.*); Prov. Toamasina, Nosy Mangabe (*P.S. Ward*); SW Antalaha (*G.D. Alpert*).

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